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14. ABSTRACT
The project has been "on hold" for much of the last year due to a change of institutions by the PI and pending the transfer of funding to the gaining institution. Data collection for the study is complete and all that remains is to complete data analysis and publication of the findings. Since the previous report, preliminary analyses suggest that six weeks of morning Blue Light Therapy versus the Amber Light Placebo condition produces significant to marginally significant improvement in daytime sleepiness, alertness and vigilance, and some aspects of motor and cognitive functioning in a small sample (n = 32). While further analyses are needed, functional magnetic resonance imaging data suggest that the Blue Light condition was effective in altering brain responses during two demanding attention and working memory tasks, whereas such changes were not evident in the Amber Light Placebo condition. These findings point toward some beneficial effects of the active treatment in reducing daytime sleepiness and sleep-related functional impairments, brain functioning, and brain structure. Completion of the project is pending final transfer of the award to the University of Arizona, which is anticipated to occur sometime in the coming year. A no-cost extension has been requested to allow this project to continue once the transfer is complete.

15. SUBJECT TERMS
Bright Light, Mild Traumatic Brain Injury, functional Magnetic Resonance Imaging (fMRI) Diffusion Tensor Imaging (DTI)

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INTRODUCTION:

Background: Mild traumatic brain injury (mTBI), or concussion, continues to be one of the leading injuries of the recent and ongoing conflicts in Iraq and Afghanistan [1]. Cognitive sequalae of this type of injury may not be noticed in the immediate aftermath of the injury, but symptoms may emerge in subsequent weeks or months and can persist for years. For many warfighters, lingering symptoms associated with post-concussion syndrome, including poor concentration, memory deficits, headaches, fatigue, mood changes, and sleep problems may significantly impact their ability to function [3-5]. Hoge and colleagues reported that 4.9% of a large sample of U.S. Army Soldiers returning from wartime deployment in Iraq endorsed having an injury with a loss of consciousness, while an additional 10.3% reported an injury with some form of altered mental status such as being "dazed, confused, or seeing stars" [2]. In particular, sleep problems are among the most frequent complaints following the injury. Interestingly, some evidence suggests that the sleep problems themselves may actually hinder recovery and brain plasticity. Available treatments for post-concussion sleep problems have only been modestly effective and are relatively cost-inefficient. Research into the effectiveness of low-cost, non-pharmacologic methods for improving sleep and strengthening cognitive functioning among servicemembers with concussion is greatly needed.

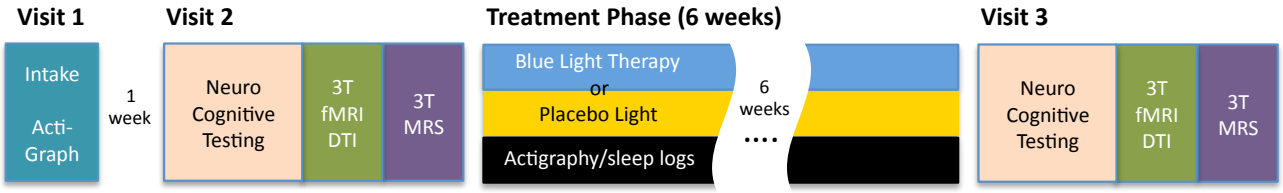
At present, recovery from mTBI and its associated symptoms simply relies on the passage of time and natural brain repair mechanisms that occur in the days and weeks following the injury. Recent data from animal models suggest that the process of natural brain repair and recovery may rely critically upon restorative mechanisms occurring during sleep [6-9]. Even among humans, there is a correlation between sleep quality and recovery from TBI [10], with poor sleepers showing less satisfactory recovery following concussion [11], while resolution of sleep disturbance is associated with improvement in cognitive functioning [10]. Unfortunately, while sleep may play a key role in neuroplasticity and brain repair, many patients with concussion are unable to obtain the amount and quality of sleep they need. In fact, more than 50% of patients with concussion report sleep problems that may persist for years after the injury [12], potentially hindering their recovery. Thus, improving sleep may be one way to enhance the recovery process.

A potentially effective treatment for the sleep problems associated with concussion is the selective application of bright light. Exposure to bright light, particularly in the blue wavelengths (BL), has been shown to stimulate melanopsin photosensitive receptors in the retina, which project directly to the suprachiasmatic nucleus of the hypothalamus, a brain structure that regulates sleep-wake cycles [13-16]. Targeted stimulation with morning BL leads to regular entrainment of the circadian rhythm, thereby improving sleep and daytime alertness [17-19]. A recent report confirmed that BL treatment reduced fatigue in patients who experienced mTBI [20], but no study has directly examined the underlying structural and functional neural plasticity associated with this treatment and its effects on sleep post-TBI.

The goal of the present investigation was to test the effectiveness of morning exposure to BL light to re-entrain the circadian rhythm, with the goal of improving nocturnal sleep, which we hypothesize lead to improvement in post-concussive symptoms. Specifically, it is hypothesized that, compared to an placebo device, daily use of morning blue light therapy device for 30 minutes will lead to improvement of sleep in a sample of individuals with a recent history of mild TBI/ concussion, thereby increasing the likelihood that they will recover more quickly, and build emotional and cognitive resilience.

Approach: The study design involved three visits to McLean Hospital. On the first visit, participants underwent a thorough screening for mTBI and qualified participants were fitted with a wrist actigraph for 24-hour a day continuous monitoring of sleep/wake cycles. Following a week of baseline actigraphy, participants returned to the lab for the second visit, which involves a comprehensive neuropsychological assessment, neuroimaging scans, and a modified multiple sleep

6-Week Treatment (n = 15 per group; N = 30 total)



Pre-Treatment Assessment

Light Therapy Intervention

Post-Treatment Assessment

latency test (MSLT). At the end of the visit, each participant was randomly assigned to either an active treatment condition (BLUE Light) or a placebo condition (AMBER Light) as shown in the figure above. Specifically, participants were provided with a commercially developed light therapy device fitted with either blue or amber light emitting diodes (LEDs). The device was to be used for 30 minutes each morning, within two hours of awakening, but no later than 11:00 am. Participants used the light devices daily for 6 weeks and then returned for the third visit to the lab. During the third visit, participants underwent a follow-up assessment session that was essentially identical to the previous assessment, including neuropsychological tests, functional and structural neuroimaging, and MSLT. During the final year of data collection, several participants have also been instructed to wear an actigraph for an additional 6-weeks after the follow-up assessment to determine the durability of treatment effects.

The initial study was designed to be completed over a 3-year period. However, at the conclusion of the third year, we received a 12-month no-cost extension (NCE) to permit us to complete additional data collection and comprehensively analyze the results. During the first quarter of the NCE, the PI accepted a position at a new academic institution (University of Arizona) and therefore closed down the study to transfer it from McLean Hospital to the University of Arizona. Requests were made to USAMRAA to permit the remaining funding to be transferred to the new institution to permit continuation of the project and final analysis. The PI's laboratory was successfully moved to the new institution on July 1, 2014, but as of the date of this report, the transfer of funding to the University of Arizona is still pending. Consequently, the project has officially remained on hold during this time until funds become available to support the final phases of the project. Herein we report the initial progress that was made during the first few months of the NCE, prior to the transfer to the new institution. We have applied for another NCE as we await transfer of the funds to the University of Arizona, and are enthusiastic about the possibility of completing this study once it has fully transferred.

BODY:

Summary Since Last Report:

Sample Characteristics. Since the last report, we have completed all data collection for the proposed study. Although the study has been on hold for most of the past year, due to the change of academic institution and pending transfer of research funds, we provide here a summary of the analyses undertaken during this year prior to the transfer. For most analyses, we include data from n = 32 participants who underwent all procedures. Of these participants, *n* = 16 (50%) received the active BLUE condition and *n* = 16 (50%) received the placebo AMBER condition. For those in the BLUE condition, there were *n* = 7 (43.8%) males and *n* = 9 (56.2%) females, while in the AMBER placebo group there were *n* = 8 (53.3%) males and *n* = 7 (46.7%) females. The ratio of males to females in the two conditions was not significantly different, $\chi^2 = 0.28$, p = .72. The two groups did not differ in terms of other basic demographic variables, as shown in the table below:

Demographics	Blue (active)		Amber (placebo)		
	M	SD	M	SD	p-value
Age	23.22	7.13	23.47	7.61	.93
Education	15.00	2.39	14.63	2.16	.65
Weight	160.81	27.76	177.87	45.78	.22
BMI	24.47	2.94	26.25	4.73	.21

With regard to injury severity, the two groups also were similar in terms of several important characteristics. As shown in the table below, there was no significant difference between the groups at baseline in terms of the number of months since injury, Neurobehavioral Symptom Inventory (NSI) scores, Stanford Sleepiness Scale (SSS), Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) Total scores, Morningness-Eveningness Questionnaire (MEQ) chronotype scores, or Functional Outcome of Sleep Questionnaire (FOSQ) scores. However, we did find that particpants in the AMBER group showed significantly worse scores on the Pittsburg Sleep Quality Index (PSQI) at baseline.

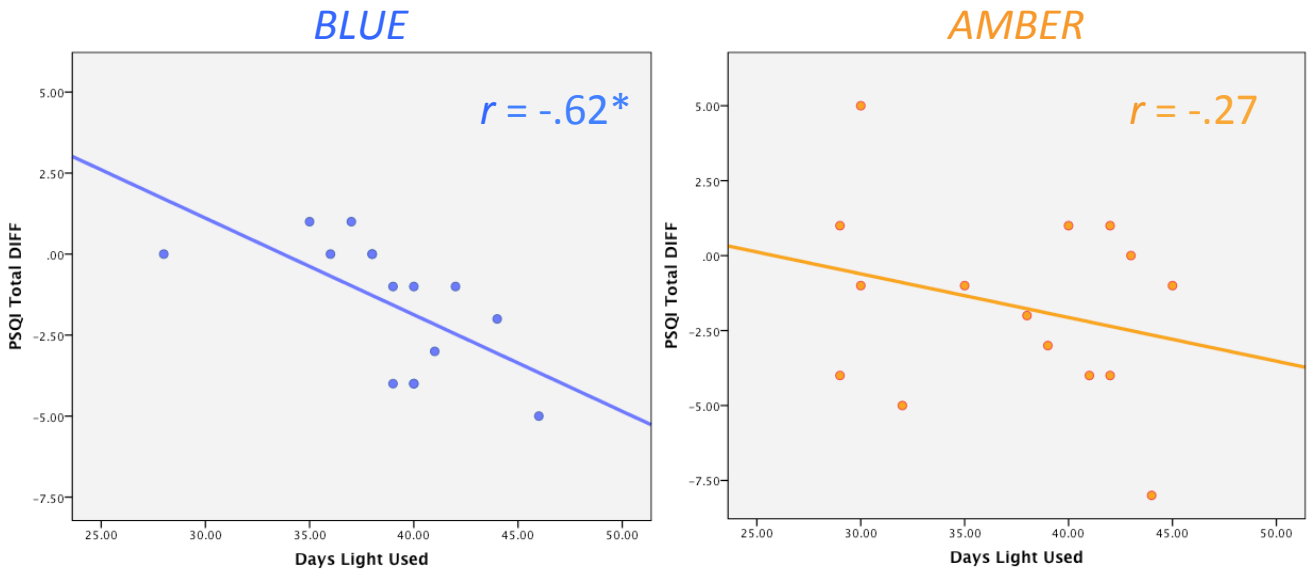
Injury Characteristics	Blue (active)		Amber (placebo)		
	M	SD	M	SD	p-value
Months since Injury	6.81	4.40	6.63	3.73	.90
NSI Score	18.38	16.42	16.94	10.50	.80
SSS	17.56	6.64	17.60	6.75	.99
RBANS Total	102.50	10.10	102.56	18.45	.99
MEQ	51.75	4.25	50.75	6.52	.61
PSQI	6.20	2.37	7.94	1.81	.03*
FOSQ	8.21	2.08	8.50	1.57	.66

One issue that we were particularly concerned about in this study was participant adherence. We had hoped to use the light monitor on the actigraph device to determine compliance of use of the light device, but found that this was impracticable as the colored wavelengths were frequently overpowered by ambient room light. Therefore, we used other metrics to determine the level of participant adherence to the protocol. Below is a summary of several indices we developed for determining participant adherence.

Adherence Measures	Blue (active)		Amber (placebo)		
	M	SD	M	SD	p-value
% Based on Sleep Diary	.91	.11	.83	.15	.12
No. Days Light Used	38.81	4.02	37.27	5.87	.40
No. Days Used after 11 am	4.19	5.53	3.31	5.68	.66
No. Days 24 hr. late report	2.38	3.65	2.80	4.49	.77
No. Days > 2 hrs after wake	2.38	3.65	2.80	4.49	.77
Ratio possible to actual use	91.06	6.83	85.54	12.62	.14
% Achieving 75% adherence	.88	.34	.75	.45	.38

As evident in the table above, the BLUE and AMBER groups did not differ in terms of any of the adherence metrics we developed in the present study. These included 1) the percentage of days in which the sleep diary had been completed within 24 hours of the time is was supposed to have been, 2) the number of days the participant reported using the light device according to the sleep diary, 3) the number of days in which a participant reported using the light outside of the specified time frame (i.e., after 11 am), 4) the number of days the participant was more than 24 hours late in completing their sleep diary, 5) the number of days the participants reported use of the light that was more than 2 hours after their reported awakening time, 6) the ratio of possible days (i.e., days with the light) to reported actual use of the light, and 7) the percentage of participants in the condition achieving at least 75% adherence. While we assume these metrics reflect the motivation and contentiousness of the participants in completing the study and using the light device, they are indirect measures, and it is conceivable that some participants may have provided inaccurate data.

The measures of adherence to the study protocol showed important associations with actual improvement as well. As evident in the figure below, participants in the active BLUE light condition showed greater reduction of sleep complaints from baseline to post-treatment as measured by the PSQI as the number of days of usage increased ($r = -.62$, $p = .014$), whereas the AMBER placebo participants did not show a significant correlation ($r = -.27$, $p = .328$). This clearly suggests that adherence to the treatment was associated with greater reduction of sleep complaints among those receiving the active treatment.

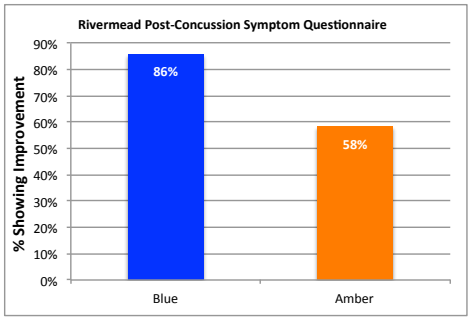


Below, we present interim study results on subjects with study protocol adherence of greater than 75% (n=26). Protocol adherence was defined as the percentage of days participants completed the "on line" sleep diary on the day they were supposed to (i.e., not retrospectively more than 24 hours later).

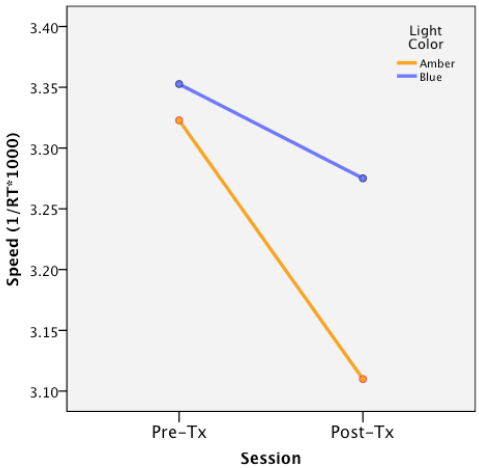
Daytime Sleepiness. The Epworth Sleepiness Scale (ESS) is the most widely used scale of excessive daytime sleepiness in the world. Our data suggested that these data were skewed in the present sample, so we transformed the data in a nonparametric measure. We calculated the ESS score difference from baseline to post-treatment and classified participants as either "improved" (i.e., any reduction in daytime sleepiness following treatment) or "not-improved" (zero change or an increase in daytime sleepiness from pre to post treatment). This analysis showed that 92.9% of the participants undergoing the BLUE light treatment showed a reduction in daytime sleepiness, compared to only 41.7% of the AMBER placebo group, $\chi^2 = 7.95$, p = .005. This suggests that nearly all participants who receive the BLUE light treatment show an improvement in daytime sleepiness.

Sleep Quality. We examined several measures of sleep quality change in our participants. Again, the data did not meet normality standards for parametric tests, so we employed simple nonparametric comparisons of improvement. In the manner used above, we calculated the FOSQ score difference from baseline to post-treatment and classified participants as either "improved" (i.e., any reduction in sleep complaints following treatment) or "not-improved" (zero change or an increase in sleep problems from pre to post treatment). For the FOSQ, we found that 84.6% of the participants undergoing the BLUE light treatment showed a reduction in sleep-related complaints, compared to 58.3% of the AMBER placebo group. This analysis did not reach statistical significance, $\chi^2 = 2.14$, p = .14.

Post-Concussion Symptom Complaints. In a parallel analysis to that described above, we also examined the effect of the light conditions on improvement in post-concussion symptoms as measured by the Rivermead Post-Concussion Symptoms Questionnaire (RPCSQ). We calculated the RPCSQ score difference from baseline to post-treatment and classified participants as either "improved" (i.e., any reduction in post-concussive complaints following treatment) or "not-improved" (zero change or an increase in post-concussive problems from pre to post treatment). We found that 85.7% of the participants undergoing the BLUE light treatment showed a reduction in post-concussion symptoms, compared to 58.3% of the AMBER placebo group. This analysis did not quite reach statistical significance, $\chi^2 = 2.14$, p = .12.



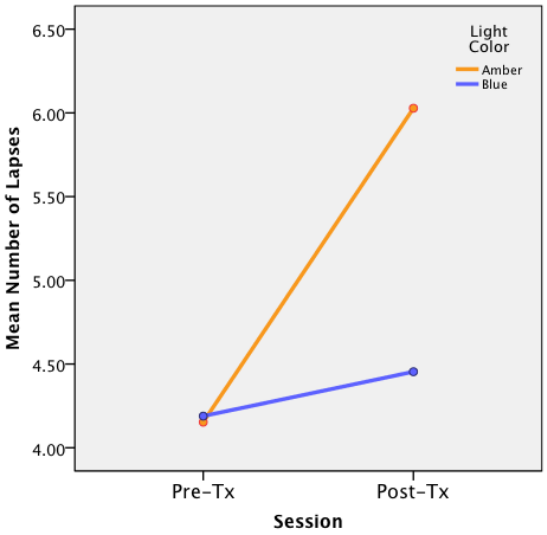
Cognitive performance: Attention. The psychomotor vigilance test (PVT) was used to evaluate general attention and vigilance performance. The PVT is a 10-minute sustained attention and reaction time task that was administered at three time points throughout each day. During the PVT, the participant viewed a screen and awaited an intermittently presented stimulus (letter "X"), which appeared at pseudo-random intervals ranging from one to 10 seconds. Upon detecting the stimulus, the participant pressed



Covariates appearing in the model are evaluated at the following values: D2_Age = 23.240, NSI_D1_total = 18.640, D2_Education = 14.480

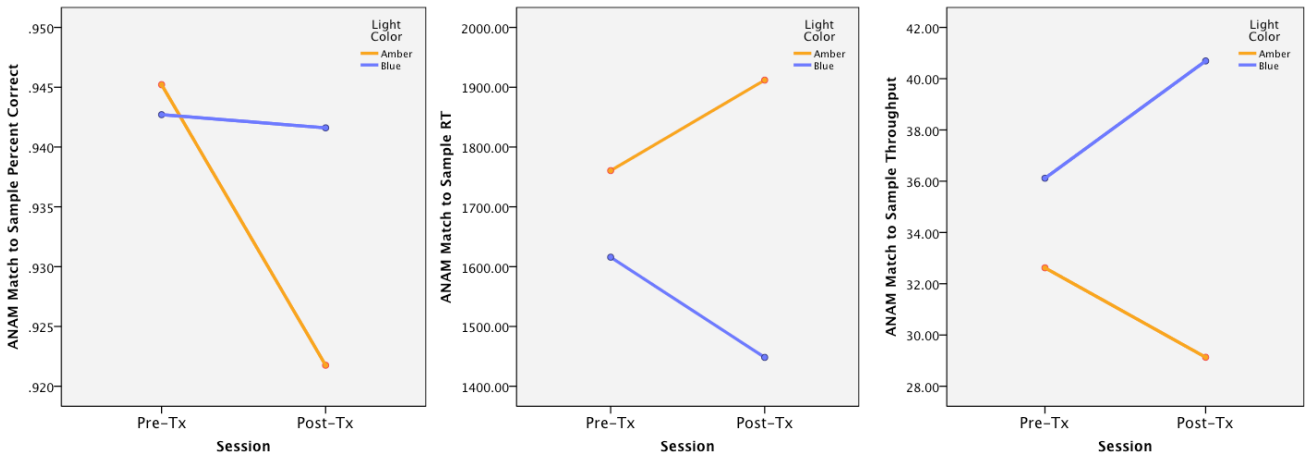
a key as rapidly as possible, registering their response time. These RT data were converted to their reciprocal, a metric known as "speed" (1/RT*1000). Mean speed scores were compared between the pre- to post-treatment sessions using a mixed ANCOVA, controlling for age, education, and baseline neurobehavioral symptom inventory scores. As shown in the figure above, there was a marginally significant interaction between condition (BLUE versus AMBER) and assessment session (pre- versus post-tx), $F(1,20) = 4.22$, $p = .053$, suggesting that the AMBER condition showed a significant decline in vigilance speed ($p < .001$) during the 6-week treatment period, whereas the BLUE light group sustained their vigilance speed between sessions ($p = .084$).

Another primary variable indicative of deficits in attention and vigilance is the number of "attentional lapses" that occur during the 10-minute PVT. These are defined as any RT lasting 500 msec or longer. The mean number of lapses for the three PVT administrations at each session was calculated. As evident in the figure at right, there was a marginally significant interaction between session and light condition, $F(1,19) = 3.70$, $p = .070$, suggesting that the AMBER condition showed a significant increase in the number of lapses ($p = .007$) during the 6-week treatment period, whereas the BLUE light group sustained their vigilance speed between sessions ($p = .63$).



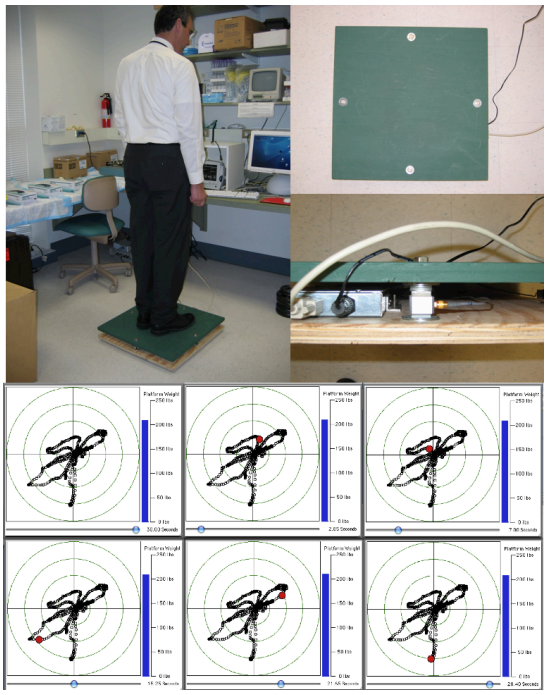
Covariates appearing in the model are evaluated at the following values: D2_Age = 23.240, D2_Education = 14.480, NSI_D1_total = 18.640, D2_RBANS_Total = 101.760

Cognitive performance: Spatial Processing and Visuospatial Working Memory. Various tasks from the Automated Neuropsychological Assessment Metrics (ANAM) were administered pre- and post-treatment. Preliminary analyses failed to show many effects on most ANAM tasks. In particular, we looked at the ANAM Match to Sample task, which measures spatial processing and visuospatial working memory. There was no significant effect of light condition on total percentage correct, $F(1,19) = 0.44$, $p = .52$. However, we did find that, after controlling for age, education, and number of days of light use, there was a significant interaction between light condition and test session for the response time for the ANAM Match to Sample subtest, $F(1,19) = 4.88$, $p = .040$, suggesting that the BLUE light participants became significantly ($p = .008$) faster than the AMBER light participants after the 6 weeks of treatment (see figure below). Moreover, there was a marginally significant interaction between light condition and session for the throughput index, $F(1,19) = 4.18$, $p = .055$, suggesting that participants in the BLUE light condition showed a significant improvement in the speed x accuracy

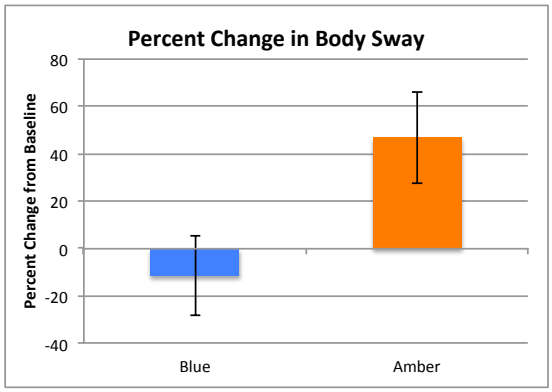


tradeoff following treatment, whereas those in the AMBER placebo condition actually were less productive following treatment.

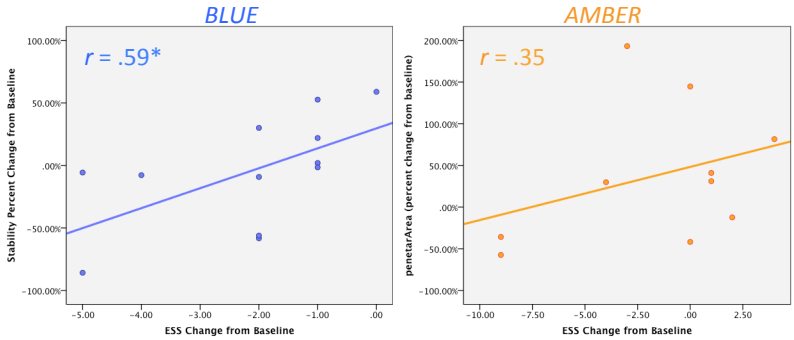
Physical Performance: Stance Stability/Body Sway.



Some evidence suggests that individuals with mTBI suffer from difficulties maintaining balance and stance stability. In this study, we used a custom-built platform to measure stance stability/body sway (see top figure at right). The device consisted of a 0.76-m square plywood platform mounted on 4 pressure sensitive load cells. Output from the cells was collected on a dedicated computer running software that computed a single point in Cartesian coordinate system at a rate of 20 Hz. Stability/sway was defined as an area measurement of the total points collected in a 30-second period (an 'episode'). For each episode, the subjects stood erect on the platform with feet together with their eyes either open or closed and with their arms either by their side or extended to the side with their palms facing upward. Participants were told to relax between each episode but did not move their feet. A series of 6 episodes were conducted.



For each participant, pre- to post-treatment data were transformed into a metric reflecting the percentage change in body sway compared to baseline. As reflected in the bottom figure at left, the BLUE light group decreased their area of movement by 11.44% while the AMBER light placebo group increased their area of movement by 46.80%. After controlling for age and education, this difference was statistically significant, $F(1,17) = 5.13$, $p = .037$. This indicates that the BLUE light individuals overall were MORE stable in their ability to hold a stance after treatment (in this case: looking straight ahead with eyes open and arms extended out from their sides). Furthermore, the change in stance stability was found to be significantly correlated with the change in daytime sleepiness from baseline to post-treatment, but only for the BLUE light group ($r = .59$, $p = .04$), but not for the AMBER light condition ($r = .35$, $p = .33$). Thus, the active BLUE light treatment was associated with an improvement in stance stability and this improvement corresponded directly to the reduction in daytime sleepiness seen over the six-week treatment period.



Functional Neuroimaging. The figure below shows functional brain activation (BLUE > AMBER) during the MSIT task, a cognitively demanding interference task that subjects performed in the MRI scanner pre-and post-intervention. Specifically, the figure depicts the change in brain activation between pre- and post-assessment for the interference condition in 22 subjects who presented with study protocol adherence greater than 75%. In line with the literature, the data tentatively suggest greater recruitment of the left prefrontal cortex/inferior frontal operculum during this task following six weeks of Blue Light compared to Amber Light.

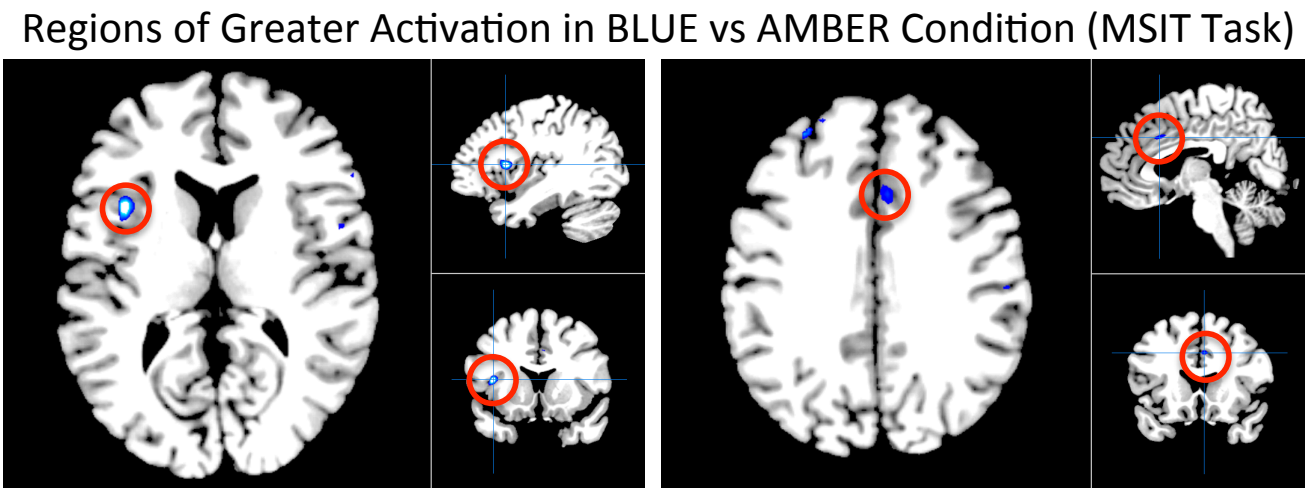
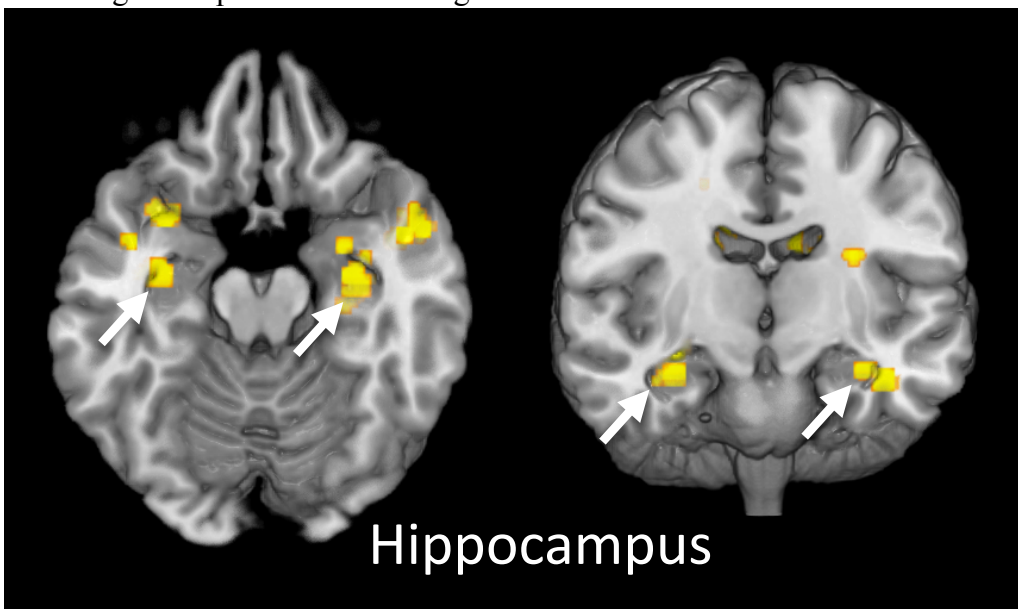


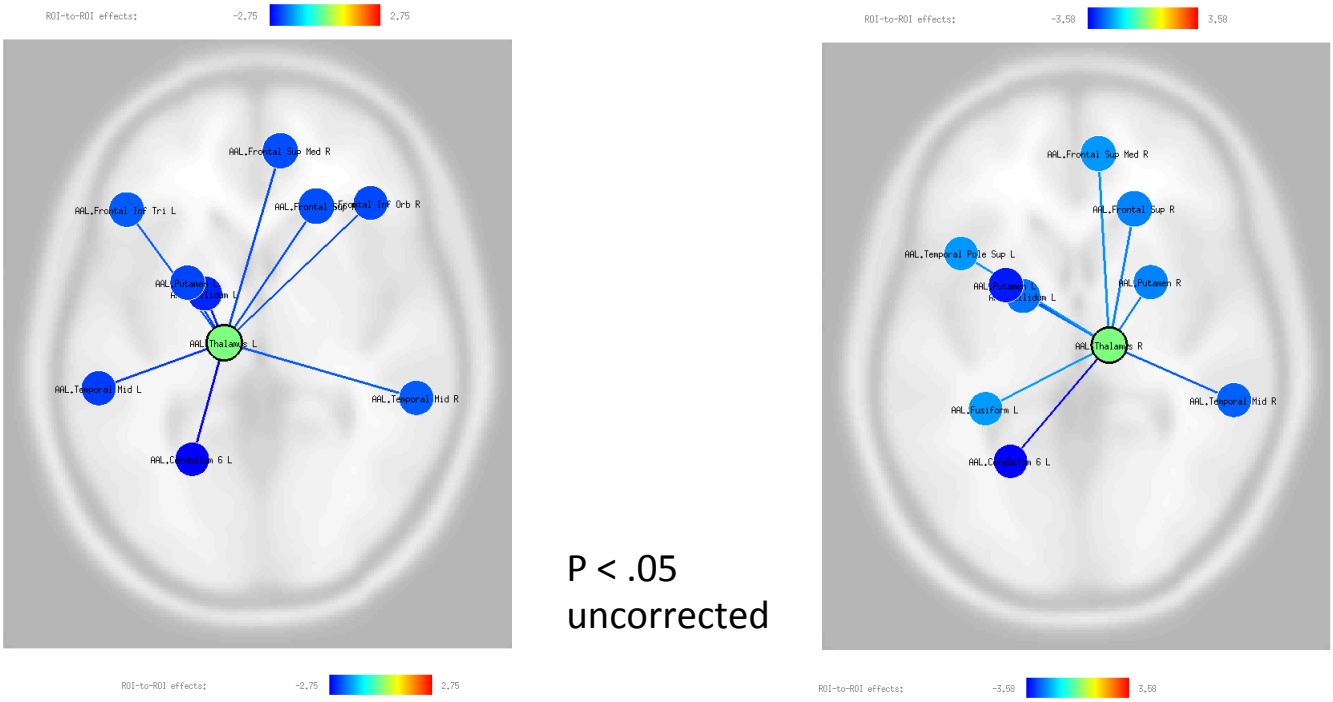
Figure 2 shows functional brain activation during the N-Back task, a working memory task that subjects performed in the MRI scanner pre-and post-intervention. Specifically, the figure depicts the change in brain activation between pre- and post-assessment for the most difficult task condition in 22 subjects who presented with study protocol adherence greater than 75%. Consistent with the literature, the data tentatively suggest greater recruitment of the bilateral hippocampi during this task following six weeks of Blue Light compared to Amber Light.



Functional Connectivity. Preliminary analysis of the functional connectivity data suggest that treatment with BLUE light relative to AMBER light appears to lead to alterations in resting state

functional connectivity between the thalamus and several cortical regions. While preliminary and carried out at an uncorrected threshold ($p < .05$), these analyses suggest that the light treatment conditions is leading to important changes in functional connectivity. Further analyses will focus on correlating these connectivity differences with important outcome variables such as neuropsychological performance and sleep quality.

Thalamic anticorrelations are greater following 6 weeks of BLUE vs AMBER light treatment



P < .05
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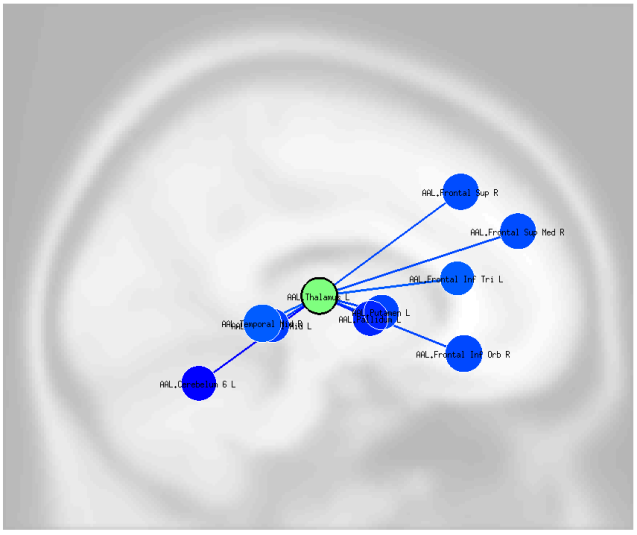
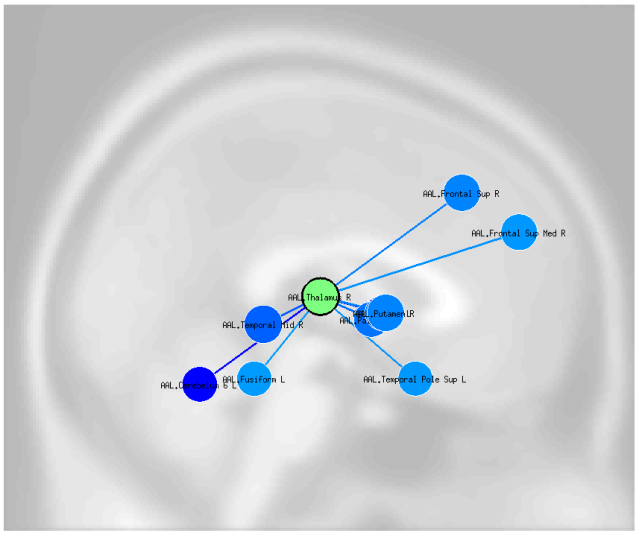
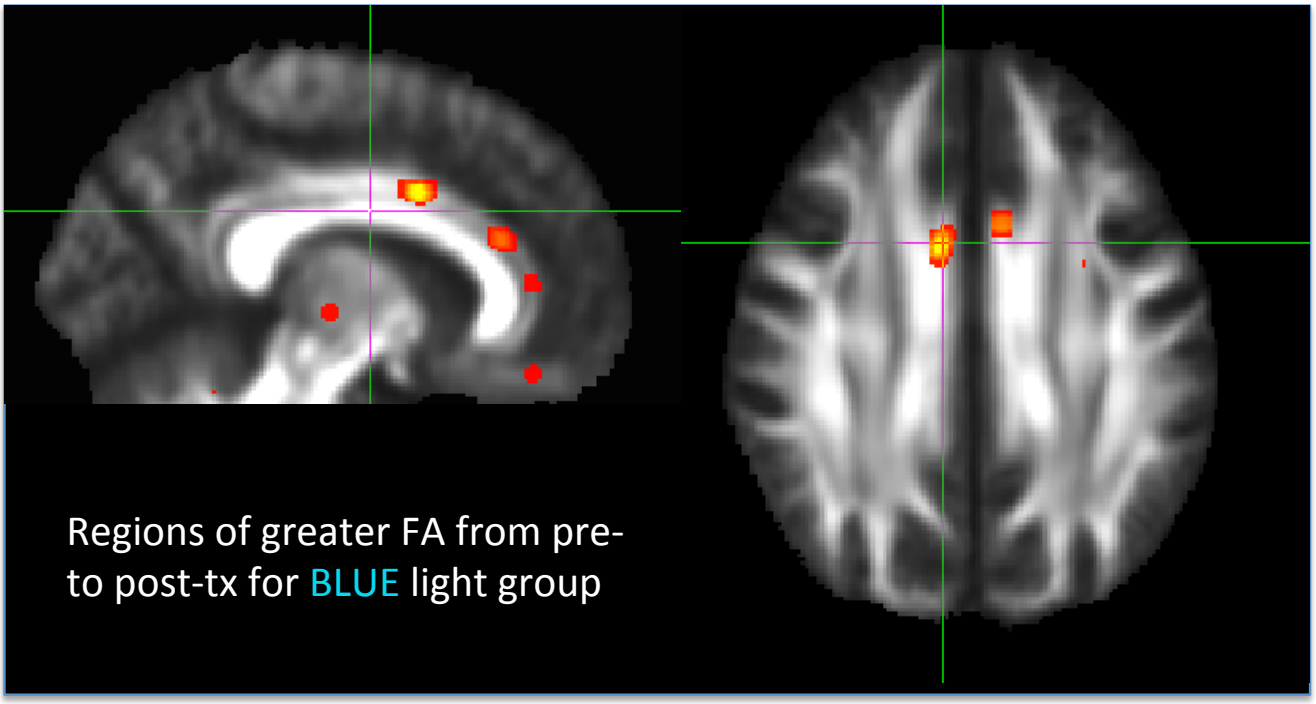


Left Thalamus



Right Thalamus

Diffusion Tensor Imaging. A critical element of the present study involves the examiniation of the effects of the BLUE light treatment on brain structure, specifically white matter axonal tracts. We used a technique known as diffusion tensor imaging (DTI) to evaluate these effects. Diffusion-weighted images were prepared using the FMRIB Software Library (FSL 5.0). After manual inspection of 36 participants' pre and post-tx images, three participants were excluded from further analysis due to the presence of major artifact or missing post/pre scans. The pre-tx and post-tx images from those in the active BLUE light condition were included in further analysis. The images were then preprocessed and analyzed separately with the goal of running pre-post repeated measures comparisons. The images in each group were eddy current corrected, BET2 was then applied to strip the brain from the skulls, and the bvec gradient vector was rotated according the output from the eddy correction. Finally, diffusivity FA measures were calculated using DTIFIT. In each of the BLUE and AMBER condition groups, voxel-wise TBSS was then conducted whereby FA images for the participants were aligned into a common MNI space using nonlinear transformations, participants data were thinned to create a "mean FA skeleton" which represents the center of all the tracts common to the group, and each participants' FA values were projected onto this skeleton and thresholded to include only voxels with FA values greater than 0.3.



Using FSL's General Linear Model (Glm) interface, paired t-tests were conducted in each of the amber and blue groups comparing pre- to post-treatment scans. Using the output design matrices and design contrast, FSL's randomise was then run within each of the amber and blue groups, using "cluster based thresholding" and 1000 permutations. The resulting significance image for the BLUE condition was dilated at a .90 (p=.10) threshold and presented as an overlay with the mean_FA_skeleton in fslview. As shown in the figure above, several small clusters, as large as 9 voxels in size, were identified at this significance level, two of which appear to be in the middle cingulum. Power is currently limited by the small sample size, but with additional participants in a future study, we hope to explore these white matter changes further and determine whether they indicate any increased neurogenesis as a result of exposure to the BLUE light condition. Because of the limited number of subjects in our analysis, the amber and blue groups have unequal pre-treatment mean global FA values. For this reason, we refrain from conducting repeated measures between groups

analysis with the placebo (amber) group until we have recruited more participants with diffusion-weighted scans.

KEY RESEARCH ACCOMPLISHMENTS:

- Data collection is complete.
- Data entry is nearly complete and quality checks, preprocessing and preliminary analyses are ongoing.
- 38 participants have been enrolled to date.
- 32 participants have completed the study.
- Preliminary results suggest that morning BLUE light therapy may improve sleep, cognition and emotion relative to a non-active placebo therapy of equal duration and intensity.

REPORTABLE OUTCOMES:

- Preliminary results have been presented at several national and international conferences (abstracts attached).

OBSTACLES:

- The PI changed institutions after the first quarter of the last performance period. Thus, the study has been "on-hold" since May/June, 2014 awaiting transfer of the project and funding to the new institution. The PI has completely established and trained a new lab at the new institution and will complete the study once the project has officially been transferred from McLean Hospital (relinquishing institution) to the University of Arizona (gaining institution).

CONCLUSION:

The study has been "on hold" since early last year, due to the transfer of the lab from McLean Hospital/Harvard Medical School to the University of Arizona. We have requested transfer of the project and balance of funds to the University of Arizona, but this process is still pending. Given that the project transfer has been pending for much of the final performance year, we have also requested a further 12-month no-cost extension to allow us to finish the project once the transfer to the University of Arizona is completed. Nonetheless, prior to the transfer, we were able to make substantial progress in analyzing the data and report a summary herein. Overall, the data suggest that six weeks of morning exposure to BLUE light versus the AMBER light placebo is effective in improving daytime sleepiness, with 93% of participants receiving the BLUE light showing improvement relative to 42% of those receiving the placebo. We also find trend level improvements in subjective sleep quality and post-concussion symptom complaints, with significant relationships between the number of days of BLUE light exposure significantly correlated with improvement in sleep quality. The BLUE light condition also shows evidence of sustained alertness and vigilance compared to the general decline seen in the placebo group. We find that the participants in the BLUE light condition were also better able to maintain balance and stance stability after treatment and this improvement corresponded directly to the reduction in daytime sleepiness seen over the six-week treatment period. Preliminary results from functional magnetic resonance imaging tasks also suggest that the BLUE Light condition was effective in altering brain responses during two demanding attention and working memory tasks, whereas such changes were not evident in the AMBER Placebo condition. Furthermore, preliminary analyses of the diffusion

tensor imaging data are encouraging, raising the possibility that the BLUE light condition may have an effect on white matter plasticity. Further analyses will be necessary to identify the extent of these effects. Overall, the findings are suggestive that morning exposure to BLUE light therapy may be a useful treatment for improving sleep, attention, balance, and some aspects of brain health among individuals who have recently suffered a mTBI. We anticipate finalizing our data analysis once the project and funding have fully transferred to the University of Arizona.

REFERENCES:

Hoge, C. W., McGurk, D., Thomas, J. L., Cox, A. L., Engel, C. C., & Castro, C. A. (2008). Mild traumatic brain injury in U.S. Soldiers returning from Iraq. *New England Journal of Medicine, 358*(5), 453-463.

APPENDICES:

Effects of Bright Light Therapy on Sleep, Cognition, Brain Function, and Neurochemistry in Mild Traumatic Brain Injury

PI: William D. "Scott" Killgore, Ph.D.

Appendix: Study Measures/Assessments

Day 1 (Assessment Day)

1. Neurobehavioral Symptom Inventory (NSI)
2. Personality Assessment Inventory (PAI)
3. Screen Time Questionnaire (STQ)
4. MINI International Neuropsychiatric Interview (MINI)

Days 2 & 3 (Scan Days)

Pre-scan

5. Multi-Source Interference Task Practice
6. N-back practice
7. Stanford Sleepiness Scale (SSS)

Scan

8. Multi-Source Interference Task
9. N-back
10. Diffusion Tensor MRI
11. Resting State MRI

Post-scan

12. Repeatable Battery for the Assessment of Neuropsychological Status
13. Automated Neuropsychological Assessment Metrics (ANAM4) TBI Battery
14. Psychomotor Vigilance Test (PVT)
15. Multiple Sleep Latency Test (MSLT)
16. Invincibility Belief Index (IBI)
17. Go/No Go
18. Body Sway and Stability (BS&S)
19. Day of Scan Information Questionnaire
20. Morningness-Eveningness Questionnaire (MEQ)
21. Functional Outcome of Sleep Questionnaire (FOSQ)
22. Evaluation of Risk (EVAR)

■Computer Administration ■Paper/Pen Questionnaires ■Administered by Study Staff

23. Patient Health Questionnaire (PHQ)
24. Pittsburgh Sleep Quality Index (PSQI)
25. Rivermead Post-Concussion Symptoms Questionnaire (RPCSQ)
26. Beck Depression Inventory (BDI)
27. Balloon Analogue Risk Task (BART)
28. Spielberger State-Trait Anxiety Inventory – STATE
29. Spielberger State-Trait Anxiety Inventory – TRAIT
30. Tower of London (ToL)

6-Week Intervention Period

1. Sleep Diary

Appendix II: Symptom Checklist Included in VA's National Traumatic Brain Injury Evaluation and Treatment Protocol

NEUROBEHAVIORAL SYMPTOM INVENTORY

Please rate the following symptoms with regard to how much they have disturbed you *SINCE YOUR INJURY*.

0 = None- Rarely if ever present; not a problem at all

1 = Mild- Occasionally present, but it does not disrupt activities; I can usually continue what I'm doing; doesn't really concern me.

2 = Moderate- Often present, occasionally disrupts my activities; I can usually continue what I'm doing with some effort; I feel somewhat concerned.

3 = Severe- Frequently present and disrupts activities; I can only do things that are fairly simple or take little effort; I feel like I need help.

4 = Very Severe- Almost always present and I have been unable to perform at work, school or home due to this problem; I probably cannot function without help.

1. Feeling dizzy:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

2. Loss of balance:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

3. Poor coordination, clumsy:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

4. Headaches:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

5. Nausea:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

6. Vision problems, blurring, trouble seeing:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

7. Sensitivity to light

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

8. Hearing difficulty:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

9. Sensitivity to noise:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

10. Numbness or tingling on parts of my body:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

11. Change in taste and/or smell:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

12. Loss of appetite or increase appetite:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

13. Poor concentration, can't pay attention, easily distracted:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

14. Forgetfulness, can't remember things:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

15. Difficulty making decisions:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

16. Slowed thinking, difficulty getting organized, can't finish things:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

17. Fatigue, loss of energy, getting tired easily:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

18. Difficulty falling or staying asleep:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

19. Feeling anxious or tense:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

20. Feeling depressed or sad:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

21. Irritability, easily annoyed:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

22. Poor frustration tolerance, feeling easily overwhelmed by things:

0	1	2	3	4
NONE	MILD	MODERATE	SEVERE	VERY SEVERE

Personality Assessment Inventory (PAI)

Personality Assessment Inventory™ (PAI®)

Leslie C. Morey, PhD

Revised and updated materials help increase the accuracy of personality assessment.

Purpose: 22 nonoverlapping full scales provide a comprehensive assessment of adult psychopathology in ages 18 years and older

Age Range: Adult
Elder Adult

Admin: Individual or group

Time: 50-60 minutes to administer; 15-20 minutes to score

Qualification: C

Sample Reports: N/A

Related Products: PAI® Professional Report Service
PAI® Software Portfolio
Personality Assessment Inventory™-Adolescent

With its newly revised Professional Manual, Profile Form Adults-Revised, and Critical Items Form-Revised, the PAI® continues to raise the standard for the assessment of adult psychopathology. This objective inventory of adult personality assesses psychopathological syndromes and provides information relevant for clinical diagnosis, treatment planning, and screening for psychopathology. Since its introduction, the PAI has been heralded as one of the most important innovations in the field of clinical assessment.

PAI® Scales and Subscales

The 344 PAI items constitute 22 nonoverlapping scales covering the constructs most relevant to a broad-based assessment of mental disorders: 4 validity scales, 11 clinical scales, 5 treatment scales, and 2 interpersonal scales. To facilitate interpretation and to cover the full range of complex clinical constructs, 10 scales contain conceptually derived subscales.

The PAI Clinical scales were developed to provide information about critical diagnostic features of 11 important clinical constructs. These 11 scales may be divided into three broad classes of disorders: those within the neurotic spectrum, those within the psychotic spectrum, and those associated with behavior disorder or impulse control problems.

The Treatment scales were developed to provide indicators of potential complications in treatment that would not necessarily be apparent from diagnostic information. These five scales include two indicators of potential for harm to self or others, two measures of the respondent's environmental circumstances, and one indicator of the respondent's motivation for treatment.

The Interpersonal scales were developed to provide an assessment of the respondent's interpersonal style along two dimensions: a warmly affiliative versus a cold rejecting style, and a dominating/controlling versus a meekly submissive style. These axes provide a useful way of conceptualizing many different mental disorders: persons at the extremes of these dimensions may present with a variety of disorders. A number of studies provide evidence that diagnostic groups differ on these dimensions.

The PAI includes a Borderline Features scale and an Antisocial Features scale. Both of these scales specifically assess character pathology. The Borderline Features scale is the only PAI scale that has four subscales, reflecting the factorial complexity of the construct. The Antisocial Features scale includes a total of three facets: one assessing antisocial behaviors, and the other two assessing antisocial traits.

Subject Number: _____ Date:_____

In a typical week, we would like to know how much and when you are using your TV and Computer. Please place a C (computer) and/or T (television) in each hour time slot to indicate use.

Time	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
12AM							
1AM							
2AM							
3AM							
4AM							
5AM							
6AM							
7AM							
8AM							
9AM							
10AM							
11AM							
12PM							
1PM							
2PM							
3PM							
4PM							
5PM							
6PM							
7PM							
8PM							
9PM							
10PM							
11PM							

M.I.N.I.

MINI INTERNATIONAL NEUROPSYCHIATRIC INTERVIEW

English Version 6.0.0

DSM-IV

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DISCLAIMER

Our aim is to assist in the assessment and tracking of patients with greater efficiency and accuracy. Before action is taken on any data collected and processed by this program, it should be reviewed and interpreted by a licensed clinician.

This program is not designed or intended to be used in the place of a full medical and psychiatric evaluation by a qualified licensed physician – psychiatrist. It is intended only as a tool to facilitate accurate data collection and processing of symptoms elicited by trained personnel.

M.I.N.I. 6.0.0 (January 1, 2009)

Patient Name:		***Patient Number:***	
Date of Birth:		***Time Interview Began:***	
Interviewer's Name:		***Time Interview Ended:***	
Date of Interview:		***Total Time:***	

	MODULES	TIME FRAME	MEETS CRITERIA	DSM-IV-TR	ICD-10	PRIMARY DIAGNOSIS
A	MAJOR DEPRESSIVE EPISODE	Current (2 weeks)	☐	296.20-296.26 Single	F32.x	☐
		Past	☐	296.20-296.26 Single	F32.x	☐
		Recurrent	☐	296.30-296.36 Recurrent	F33.x	☐
B	SUICIDALITY	Current (Past Month) ☐ Low ☐ Moderate ☐ High	☐			
C	MANIC EPISODE	Current	☐	296.00-296.06	F30.x-F31.9	☐
		Past	☐			
	HYPOMANIC EPISODE	Current	☐	296.80-296.89	F31.8-F31.9/F34.0	☐
		Past	☐			
	BIPOLAR I DISORDER	Current	☐	296.0x-296.6x	F30.x-F31.9	☐
		Past	☐	296.0x-296.6x	F30.x-F31.9	☐
	BIPOLAR II DISORDER	Current	☐	296.89	F31.8	☐
		Past	☐	296.89	F31.8	☐
	BIPOLAR DISORDER NOS	Current	☐	296.80	F31.9	☐
		Past	☐	296.80	F31.9	☐
D	PANIC DISORDER	Current (Past Month)	☐	300.01/300.21	F40.01-F41.0	☐
		Lifetime	☐			
E	AGORAPHOBIA	Current	☐	300.22	F40.00	☐
F	SOCIAL PHOBIA (Social Anxiety Disorder)	Current (Past Month)				
		Generalized	☐	300.23	F40.1	☐
		Non-Generalized	☐	300.23	F40.1	☐
G	OBSESSIVE-COMPULSIVE DISORDER	Current (Past Month)	☐	300.3	F42.8	☐
H	POSTTRAUMATIC STRESS DISORDER	Current (Past Month)	☐	309.81	F43.1	☐
I	ALCOHOL DEPENDENCE	Past 12 Months	☐	303.9	F10.2x	☐
	ALCOHOL ABUSE	Past 12 Months	☐	305.00	F10.1	☐
J	SUBSTANCE DEPENDENCE (Non-alcohol)	Past 12 Months	☐	304.00-.90/305.20-.90	F11.1-F19.1	☐
	SUBSTANCE ABUSE (Non-alcohol)	Past 12 Months	☐	304.00-.90/305.20-.90	F11.1-F19.1	☐
K	PSYCHOTIC DISORDERS	Lifetime	☐	295.10-295.90/297.1/	F20.xx-F29	☐
		Current	☐	297.3/293.81/293.82/ 293.89/298.8/298.9		
	MOOD DISORDER WITH	Lifetime	☐	296.24/296.34/296.44	F32.3/F33.3/	☐
	PSYCHOTIC FEATURES	Current	☐	296.24/296.34/296.44	F30.2/F31.2/F31.5 F31.8/F31.9/F39	☐
L	ANOREXIA NERVOSA	Current (Past 3 Months)	☐	307.1	F50.0	☐
M	BULIMIA NERVOSA	Current (Past 3 Months)	☐	307.51	F50.2	☐
	ANOREXIA NERVOSA, BINGE EATING/PURGING TYPE	Current	☐	307.1	F50.0	☐
N	GENERALIZED ANXIETY DISORDER	Current (Past 6 Months)	☐	300.02	F41.1	☐
O	MEDICAL, ORGANIC, DRUG CAUSE RULED OUT		☐ No	☐ Yes	☐Uncertain	
P	ANTISOCIAL PERSONALITY DISORDER	Lifetime	☐	301.7	F60.2	☐

IDENTIFY THE PRIMARY DIAGNOSIS BY CHECKING THE APPROPRIATE CHECK BOX.
(Which problem troubles you the most or dominates the others or came first in the natural history?)

The translation from DSM-IV-TR to ICD-10 coding is not always exact. For more information on this topic see Schulte-Markwort. Crosswalks ICD-10/DSM-IV-TR. Hogrefe & Huber Publishers 2006.

GENERAL INSTRUCTIONS

The M.I.N.I. was designed as a brief structured interview for the major Axis I psychiatric disorders in DSM-IV and ICD-10. Validation and reliability studies have been done comparing the M.I.N.I. to the SCID-P for DSM-III-R and the CIDI (a structured interview developed by the World Health Organization). The results of these studies show that the M.I.N.I. has similar reliability and validity properties, but can be administered in a much shorter period of time (mean 18.7 ± 11.6 minutes, median 15 minutes) than the above referenced instruments. It can be used by clinicians, after a brief training session. Lay interviewers require more extensive training.

INTERVIEW:

In order to keep the interview as brief as possible, inform the patient that you will conduct a clinical interview that is more structured than usual, with very precise questions about psychological problems which require a yes or no answer.

GENERAL FORMAT:

The M.I.N.I. is divided into **modules** identified by letters, each corresponding to a diagnostic category.

•At the beginning of each diagnostic module (except for psychotic disorders module), screening question(s) corresponding to the main criteria of the disorder are presented in a **gray box**.

•At the end of each module, diagnostic box(es) permit the clinician to indicate whether diagnostic criteria are met.

CONVENTIONS:

Sentences written in « normal font » should be read exactly as written to the patient in order to standardize the assessment of diagnostic criteria.

Sentences written in « CAPITALS » should not be read to the patient. They are instructions for the interviewer to assist in the scoring of the diagnostic algorithms.

Sentences written in « **bold** » indicate the time frame being investigated. The interviewer should read them as often as necessary. Only symptoms occurring during the time frame indicated should be considered in scoring the responses.

Answers with an arrow above them (➡) indicate that one of the criteria necessary for the diagnosis(es) is not met. In this case, the interviewer should go to the end of the module, circle « **NO** » in all the diagnostic boxes and move to the next module.

When terms are separated by a *slash (/)* the interviewer should read only those symptoms known to be present in the patient (for example, question G6).

Phrases in (parentheses) are clinical examples of the symptom. These may be read to the patient to clarify the question.

RATING INSTRUCTIONS:

All questions must be rated. The rating is done at the right of each question by circling either Yes or No. Clinical judgment by the rater should be used in coding the responses. Interviewers need to be sensitive to the diversity of cultural beliefs in their administration of questions and rating of responses. The rater should ask for examples when necessary, to ensure accurate coding. The patient should be encouraged to ask for clarification on any question that is not absolutely clear.

The clinician should be sure that each dimension of the question is taken into account by the patient (for example, time frame, frequency, severity, and/or alternatives).

Symptoms better accounted for by an organic cause or by the use of alcohol or drugs should not be coded positive in the M.I.N.I. The M.I.N.I. Plus has questions that investigate these issues.

For any questions, suggestions, need for a training session or information about updates of the M.I.N.I., please contact:

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A. MAJOR DEPRESSIVE EPISODE

(➡ MEANS : GO TO THE DIAGNOSTIC BOXES, CIRCLE **NO** IN ALL DIAGNOSTIC BOXES, AND MOVE TO THE NEXT MODULE)

A1	a	Were you <u>ever</u> depressed or down, most of the day, nearly every day, for two weeks?	NO	YES
		IF NO, CODE NO TO **A1b**: IF **YES** ASK:		
	b	<u>For the past two weeks,</u> were you depressed or down, most of the day, nearly every day?	NO	YES
A2	a	Were you <u>ever</u> much less interested in most things or much less able to enjoy the things you used to enjoy most of the time, for two weeks?	NO	YES
		IF NO, CODE NO TO **A2b**: IF **YES** ASK:		
	b	In the <u>past two weeks</u>, were you much less interested in most things or much less able to enjoy the things you used to enjoy, most of the time?	NO	YES
		➡ IS **A1a** OR **A2a** CODED **YES**?	NO	YES

A3 IF **A1b** OR **A2b** = **YES**: EXPLORE THE **CURRENT** AND THE MOST SYMPTOMATIC **PAST** EPISODE, OTHERWISE
IF **A1b** AND **A2b** = **NO**: EXPLORE ONLY THE MOST SYMPTOMATIC **PAST** EPISODE

Over that two week period, when you felt depressed or uninterested:

		<u>Past 2 Weeks</u>		<u>Past Episode</u>	
a	Was your appetite decreased or increased nearly every day? Did your weight decrease or increase without trying intentionally (i.e., by ±5% of body weight or ±8 lbs. or ±3.5 kgs., for a 160 lb./70 kg. person in a month)? IF **YES** TO EITHER, CODE **YES**.	NO	YES	NO	YES
b	Did you have trouble sleeping nearly every night (difficulty falling asleep, waking up in the middle of the night, early morning wakening or sleeping excessively)?	NO	YES	NO	YES
c	Did you talk or move more slowly than normal or were you fidgety, restless or having trouble sitting still almost every day?	NO	YES	NO	YES
d	Did you feel tired or without energy almost every day?	NO	YES	NO	YES
e	Did you feel worthless or guilty almost every day?	NO	YES	NO	YES
	IF **YES**, ASK FOR EXAMPLES. THE EXAMPLES ARE CONSISTENT WITH A DELUSIONAL IDEA. Current Episode ❒ No ❒ Yes; Past Episode ❒ No ❒ Yes				
f	Did you have difficulty concentrating or making decisions almost every day?	NO	YES	NO	YES
g	Did you repeatedly consider hurting yourself, feel suicidal, or wish that you were dead? Did you attempt suicide or plan a suicide? IF **YES TO EITHER, CODE YES.**	NO	YES	NO	YES
A4	Did these symptoms cause significant problems at home, at work, socially, at school or in some other important way?	NO	YES	NO	YES

A5 In between 2 episodes of depression, did you ever have an interval of at least 2 months, without any significant depression or any significant loss of interest? NO YES

ARE **5** OR MORE ANSWERS (**A1-A3**) CODED **YES** AND IS **A4** CODED YES FOR THAT TIME FRAME?

SPECIFY IF THE EPISODE IS CURRENT AND / OR PAST.

IF **A5** IS CODED **YES,** CODE **YES** FOR RECURRENT.

NO	**YES**
MAJOR DEPRESSIVE EPISODE	
CURRENT	❒
PAST	❒
RECURRENT	❒

A6 a How many episodes of depression did you have in your lifetime? _____

Between each episode there must be at least 2 months without any significant depression.

B. SUICIDALITY

				Points
	In the past month did you:			
B1	Suffer any accident? IF NO TO B1, SKIP TO B2; IF YES, ASK B1a:	NO	YES	0
B1a	Plan or intend to hurt yourself in that accident either actively or passively (e.g. not avoiding a risk)? IF NO TO B1a, SKIP TO B2: IF YES, ASK B1b:	NO	YES	0
B1b	Intend to die as a result of this accident?	NO	YES	0
B2	Feel hopeless?	NO	YES	1
B3	Think that you would be better off dead or wish you were dead?	NO	YES	1
B4	Want to harm yourself or to hurt or to injure yourself or have mental images of harming yourself?	NO	YES	2
B5	Think about suicide? IF NO TO B5, SKIP TO B7. OTHERWISE ASK:	NO	YES	6

Frequency		Intensity	
Occasionally	❒	Mild	❒
Often	❒	Moderate	❒
Very often	❒	Severe	❒

	Can you state that you will not act on these impulses during this treatment program?	NO	YES	
B6	Feel unable to control these impulses?	NO	YES	8
B7	Have a suicide plan?	NO	YES	8
B8	Take any active steps to prepare to injure yourself or to prepare for a suicide attempt in which you expected or intended to die?	NO	YES	9
B9	Deliberately injure yourself without intending to kill yourself?	NO	YES	4
B10	Attempt suicide? IF NO SKIP TO B11: Hope to be rescued / survive ❒ Expected / intended to die ❒	NO	YES	9
	In your lifetime:			
B11	Did you ever make a suicide attempt?	NO	YES	4

IS AT LEAST **1** OF THE ABOVE (EXCEPT B1) CODED **YES**?

IF YES, ADD THE TOTAL POINTS FOR THE ANSWERS (B1-B11) CHECKED 'YES' AND SPECIFY THE SUICIDALITY SCORE AS INDICATED IN THE DIAGNOSTIC BOX:

MAKE ANY ADDITIONAL COMMENTS ABOUT YOUR ASSESSMENT OF THIS PATIENT'S CURRENT AND NEAR FUTURE SUICIDALITY IN THE SPACE BELOW:

NO **YES**

SUICIDALITY CURRENT

1-8 points	Low	❒
9-16 points	Moderate	❒
≥ 17 points	High	❒

C. MANIC AND HYPOMANIC EPISODES

(➡ MEANS : GO TO THE DIAGNOSTIC BOXES, CIRCLE NO IN MANIC AND HYPOMANIC DIAGNOSTIC BOXES, AND MOVE TO NEXT MODULE)

Do you have any family history of manic depressive illness or bipolar disorder, or any family member who had mood swings treated with a medication like lithium, sodium valproate (Depakote) or lamotrigine (Lamictal)? NO YES

THIS QUESTION IS NOT A CRITERION FOR BIPOLAR DISORDER, BUT IS ASKED TO INCREASE THE CLINICIAN'S VIGILANCE ABOUT THE RISK FOR BIPOLAR DISORDER .

IF YES, PLEASE SPECIFY WHO:_____

C1 a Have you **ever** had a period of time when you were feeling 'up' or 'high' or 'hyper' or so full of energy or full of yourself that you got into trouble, - or that other people thought you were not your usual self? (Do not consider times when you were intoxicated on drugs or alcohol.) NO YES

IF PATIENT IS PUZZLED OR UNCLEAR ABOUT WHAT YOU MEAN BY 'UP' OR 'HIGH' OR 'HYPER', CLARIFY AS FOLLOWS: By 'up' or 'high' or 'hyper' I mean: having elated mood; increased energy; needing less sleep; having rapid thoughts; being full of ideas; having an increase in productivity, motivation, creativity, or impulsive behavior; phoning or working excessively or spending more money.

IF NO, CODE NO TO **C1b**: IF **YES** ASK:

b Are you currently feeling 'up' or 'high' or 'hyper' or full of energy? NO YES

C2 a Have you **ever** been persistently irritable, for several days, so that you had arguments or verbal or physical fights, or shouted at people outside your family? Have you or others noticed that you have been more irritable or over reacted, compared to other people, even in situations that you felt were justified? NO YES

IF NO, CODE NO TO **C2b**: IF **YES** ASK:

b Are you currently feeling persistently irritable? NO YES

➡

IS **C1a** OR **C2a** CODED **YES**? NO YES

C3 IF **C1b** OR **C2b** = **YES**: EXPLORE THE **CURRENT** AND THE MOST SYMPTOMATIC **PAST** EPISODE, OTHERWISE
IF **C1b** AND **C2b** = **NO**: EXPLORE ONLY THE MOST SYMPTOMATIC **PAST** EPISODE

During the times when you felt high, full of energy, or irritable did you:

		Current Episode		Past Episode	
a	Feel that you could do things others couldn't do, or that you were an especially important person? IF **YES**, ASK FOR EXAMPLES. THE EXAMPLES ARE CONSISTENT WITH A DELUSIONAL IDEA. Current Episode ❒ No ❒ Yes Past Episode ❒ No ❒ Yes	NO	YES	NO	YES
b	Need less sleep (for example, feel rested after only a few hours sleep)?	NO	YES	NO	YES
c	Talk too much without stopping, or so fast that people had difficulty understanding?	NO	YES	NO	YES
d	Have racing thoughts?	NO	YES	NO	YES

		Current Episode		Past Episode	
e	Become easily distracted so that any little interruption could distract you?	NO	YES	NO	YES
f	Have a significant increase in your activity or drive, at work, at school, socially or sexually or did you become physically or mentally restless?	NO	YES	NO	YES
g	Want so much to engage in pleasurable activities that you ignored the risks or consequences (for example, spending sprees, reckless driving, or sexual indiscretions)?	NO	YES	NO	YES

C3 SUMMARY: WHEN RATING CURRENT EPISODE: NO YES NO YES

IF C1b IS NO, ARE 4 OR MORE C3 ANSWERS CODED YES?
IF C1b IS YES, ARE 3 OR MORE C3 ANSWERS CODED YES?

WHEN RATING PAST EPISODE:
IF C1a IS NO, ARE 4 OR MORE C3 ANSWERS CODED YES?
IF C1a IS YES, ARE 3 OR MORE C3 ANSWERS CODED YES?

CODE YES ONLY IF THE ABOVE 3 OR 4 SYMPTOMS OCCURRED DURING THE SAME TIME PERIOD.

RULE: ELATION/EXPANSIVENESS REQUIRES ONLY THREE C3 SYMPTOMS, WHILE IRRITABLE MOOD ALONE REQUIRES 4 OF THE C3 SYMPTOMS.

		Current Episode	Past Episode
C4	What is the longest time these symptoms lasted?		
	a) 3 days or less	❒	❒
	b) 4 to 6 days	❒	❒
	c) 7 days or more	❒	❒

C5	Were you hospitalized for these problems?	NO	YES	NO	YES

IF YES, STOP HERE AND CIRCLE YES IN MANIC EPISODE FOR THAT TIME FRAME.

C6	Did these symptoms cause significant problems at home, at work, socially in your relationships with others, at school or in some other important way?	NO	YES	NO	YES

ARE **C3** SUMMARY AND **C5** AND **C6** CODED **YES** AND EITHER **C4a or b or c** CODED **YES**?

OR

ARE **C3** SUMMARY AND **C4c** AND **C6** CODED **YES** AND IS **C5** CODED **NO**?

SPECIFY IF THE EPISODE IS CURRENT AND / OR PAST.

NO **YES**

MANIC EPISODE

CURRENT ❒
PAST ❒

ARE **C3** SUMMARY **AND C5** AND **C6** CODED **NO** AND EITHER **C4b** OR **C4c** CODED **YES**?

OR

ARE **C3** SUMMARY AND **C4b** AND **C6** CODED **YES** AND IS **C5** CODED **NO?**

SPECIFY IF THE EPISODE IS CURRENT AND / OR PAST.

NO **YES**

HYPOMANIC EPISODE

CURRENT ❒
PAST ❒

ARE **C3** SUMMARY AND **C4a** CODED **YES** AND IS **C5** CODED **NO**? **NO** **YES**

HYPOMANIC SYMPTOMS

SPECIFY IF THE EPISODE IS CURRENT AND / OR PAST.

CURRENT ❒
PAST ❒

C7 a) IF MANIC EPISODE IS POSITIVE FOR EITHER CURRENT OR PAST ASK:
Did you have 2 or more manic episodes (**C4c**) in your lifetime (including the current episode if present)? NO YES

b) IF HYPOMANIC EPISODE IS POSITIVE FOR EITHER CURRENT OR PAST ASK:
Did you have 2 or more hypomanic EPISODES (**C4b**) in your lifetime (including the current episode)? NO YES

c) IF PAST "HYPOMANIC SYMPTOMS" IS CODED POSITIVE ASK:
Did you have 2 or more episodes of hypomanic SYMPTOMS (**C4a**) in your lifetime
(including the current episode if present)? NO YES

D. PANIC DISORDER

(➡ MEANS : CIRCLE NO IN D5, D6 AND D7 AND SKIP TO E1)

D1	a	Have you, on more than one occasion, had spells or attacks when you **suddenly** felt anxious, frightened, uncomfortable or uneasy, even in situations where most people would not feel that way?	➡ NO	YES
	b	Did the spells surge to a peak within 10 minutes of starting?	➡ NO	YES
D2		At any time in the past, did any of those spells or attacks come on unexpectedly or occur in an unpredictable or unprovoked manner?	➡ NO	YES
D3		Have you ever had one such attack followed by a month or more of persistent concern about having another attack, or worries about the consequences of the attack - or did you make a significant change in your behavior because of the attacks (e.g., shopping only with a companion, not wanting to leave your house, visiting the emergency room repeatedly, or seeing your doctor more frequently because of the symptoms)?	NO	YES
D4		**During the worst attack that you can remember:**		
	a	Did you have skipping, racing or pounding of your heart?	NO	YES
	b	Did you have sweating or clammy hands?	NO	YES
	c	Were you trembling or shaking?	NO	YES
	d	Did you have shortness of breath or difficulty breathing?	NO	YES
	e	Did you have a choking sensation or a lump in your throat?	NO	YES
	f	Did you have chest pain, pressure or discomfort?	NO	YES
	g	Did you have nausea, stomach problems or sudden diarrhea?	NO	YES
	h	Did you feel dizzy, unsteady, lightheaded or faint?	NO	YES
	i	Did things around you feel strange, unreal, detached or unfamiliar, or did you feel outside of or detached from part or all of your body?	NO	YES
	j	Did you fear that you were losing control or going crazy?	NO	YES
	k	Did you fear that you were dying?	NO	YES
	l	Did you have tingling or numbness in parts of your body?	NO	YES
	m	Did you have hot flushes or chills?	NO	YES
D5		ARE BOTH **D3,** AND **4** OR MORE **D4** ANSWERS, CODED **YES**? IF YES TO D5, SKIP TO D7.	NO	YES *PANIC DISORDER LIFETIME*
D6		IF **D5** = **NO,** ARE ANY D4 ANSWERS CODED **YES**? THEN SKIP TO **E1.**	NO	YES *LIMITED SYMPTOM ATTACKS LIFETIME*

D7 In the past month, did you have such attacks repeatedly (2 or more), and did you have persistent concern about having another attack, or worry about the consequences of the attacks, or did you change your behavior in any way because of the attacks? NO YES

PANIC DISORDER CURRENT

E. AGORAPHOBIA

E1 Do you feel anxious or uneasy in places or situations where help might not be available or escape might be difficult, like being in a crowd, standing in a line (queue), when you are alone away from home or alone at home, or when crossing a bridge, or traveling in a bus, train or car or where you might have a panic attack or the panic-like symptoms we just spoke about? NO YES

IF **E1** = **NO**, CIRCLE **NO** IN **E2**.

E2 Do you fear these situations so much that you avoid them, or suffer through them, or need a companion to face them? NO YES

AGORAPHOBIA CURRENT

IS **E2** (CURRENT AGORAPHOBIA) CODED **YES**

and

IS **D7** (CURRENT PANIC DISORDER) CODED **YES**?

NO **YES**

PANIC DISORDER with Agoraphobia CURRENT

IS **E2** (CURRENT AGORAPHOBIA) CODED **NO**

and

IS **D7** (CURRENT PANIC DISORDER) CODED **YES**?

NO **YES**

PANIC DISORDER without Agoraphobia CURRENT

IS **E2** (CURRENT AGORAPHOBIA) CODED **YES**

and

IS **D5** (PANIC DISORDER LIFETIME) CODED **NO**?

NO **YES**

AGORAPHOBIA, CURRENT without history of Panic Disorder

F. SOCIAL PHOBIA (Social Anxiety Disorder)

(➡ MEANS : GO TO THE DIAGNOSTIC BOX, CIRCLE NO AND MOVE TO THE NEXT MODULE)

F1	In the past month, did you have persistent fear and significant anxiety at being watched, being the focus of attention, or of being humiliated or embarrassed? This includes things like speaking in public, eating in public or with others, writing while someone watches, or being in social situations.	➡ NO	YES
F2	Is this social fear excessive or unreasonable and does it almost always make you anxious?	➡ NO	YES
F3	Do you fear these social situations so much that you avoid them or suffer through them most of the time?	➡ NO	YES
F4	Do these social fears disrupt your normal work, school or social functioning or cause you significant distress?		

SUBTYPES

Do you fear and avoid 4 or more social situations?

If YES Generalized social phobia (social anxiety disorder)

If NO Non-generalized social phobia (social anxiety disorder)

EXAMPLES OF SUCH SOCIAL SITUATIONS TYPICALLY INCLUDE

- INITIATING OR MAINTAINING A CONVERSATION,
- PARTICIPATING IN SMALL GROUPS,
- DATING,
- SPEAKING TO AUTHORITY FIGURES,
- ATTENDING PARTIES,
- PUBLIC SPEAKING,
- EATING IN FRONT OF OTHERS,
- URINATING IN A PUBLIC WASHROOM, ETC.

NOTE TO INTERVIEWER: PLEASE ASSESS WHETHER THE SUBJECT'S FEARS ARE RESTRICTED TO NON-GENERALIZED ("ONLY 1 OR SEVERAL") SOCIAL SITUATIONS OR EXTEND TO GENERALIZED ("MOST") SOCIAL SITUATIONS. "MOST" SOCIAL SITUATIONS IS USUALLY OPERATIONALIZED TO MEAN 4 OR MORE SOCIAL SITUATIONS, ALTHOUGH THE DSM-IV DOES NOT EXPLICITLY STATE THIS.

NO **YES**

SOCIAL PHOBIA
(Social Anxiety Disorder)
CURRENT

GENERALIZED ❒

NON-GENERALIZED ❒

G. OBSESSIVE-COMPULSIVE DISORDER

(➡ MEANS: GO TO THE DIAGNOSTIC BOX, CIRCLE NO AND MOVE TO THE NEXT MODULE)

G1 In the past month, have you been bothered by recurrent thoughts, impulses, or images that were unwanted, distasteful, inappropriate, intrusive, or distressing? - (For example, the idea that you were dirty, contaminated or had germs, **or** fear of contaminating others, **or** fear you would act on some impulse, **or** fear or superstitions that you would be responsible for things going wrong, **or** obsessions with sexual thoughts, images or impulses, **or** hoarding, collecting, **or** religious obsessions.)

(DO NOT INCLUDE SIMPLY EXCESSIVE WORRIES ABOUT REAL LIFE PROBLEMS. DO NOT INCLUDE OBSESSIONS DIRECTLY RELATED TO EATING DISORDERS, SEXUAL DEVIATIONS, PATHOLOGICAL GAMBLING, OR ALCOHOL OR DRUG ABUSE BECAUSE THE PATIENT MAY DERIVE PLEASURE FROM THE ACTIVITY AND MAY WANT TO RESIST IT ONLY BECAUSE OF ITS NEGATIVE CONSEQUENCES.)

NO YES
↓
SKIP TO **G4**

G2 Did they keep coming back into your mind even when you tried to ignore or get rid of them?

NO YES
↓
SKIP TO **G4**

G3 Do you think that these obsessions are the product of your own mind and that they are not imposed from the outside?

NO YES
obsessions

G4 In the past month, did you do something repeatedly without being able to resist doing it, like washing or cleaning excessively, counting or checking things over and over, or repeating, collecting, arranging things, or other superstitious rituals?

NO YES
compulsions

➡

IS **G3** OR **G4** CODED **YES**?

NO YES

➡

G5 At any point, did you recognize that either these obsessive thoughts or these compulsive behaviors were excessive or unreasonable?

NO YES

G6 In the past month, did these obsessive thoughts and/or compulsive behaviors significantly interfere with your normal routine, your work or school, your usual social activities, or relationships, or did they take more than one hour a day?

NO **YES**

O.C.D. CURRENT

H. POSTTRAUMATIC STRESS DISORDER

(➡ MEANS : GO TO THE DIAGNOSTIC BOX, CIRCLE NO, AND MOVE TO THE NEXT MODULE)

H1	Have you ever experienced or witnessed or had to deal with an extremely traumatic event that included actual or threatened death or serious injury to you or someone else? EXAMPLES OF TRAUMATIC EVENTS INCLUDE: SERIOUS ACCIDENTS, SEXUAL OR PHYSICAL ASSAULT, A TERRORIST ATTACK, BEING HELD HOSTAGE, KIDNAPPING, FIRE, DISCOVERING A BODY, WAR, OR NATURAL DISASTER, WITNESSING THE VIOLENT OR SUDDEN DEATH OF SOMEONE CLOSE TO YOU, OR A LIFE THREATENING ILLNESS.	➡ NO	YES
H2	Did you respond with intense fear, helplessness or horror?	➡ NO	YES
H3	During the past month, have you re-experienced the event in a distressing way (such as in dreams, intense recollections, flashbacks or physical reactions) or did you have intense distress when you were reminded about the event or exposed to a similar event?	➡ NO	YES

H4	**In the past month:**			
	a	Have you avoided thinking about or talking about the event ?	NO	YES
	b	Have you avoided activities, places or people that remind you of the event?	NO	YES
	c	Have you had trouble recalling some important part of what happened?	NO	YES
	d	Have you become much less interested in hobbies or social activities?	NO	YES
	e	Have you felt detached or estranged from others?	NO	YES
	f	Have you noticed that your feelings are numbed?	NO	YES
	g	Have you felt that your life will be shortened or that you will die sooner than other people?	NO	YES
		ARE **3** OR MORE **H4** ANSWERS CODED **YES**?	➡ NO	YES
H5	**In the past month:**			
	a	Have you had difficulty sleeping?	NO	YES
	b	Were you especially irritable or did you have outbursts of anger?	NO	YES
	c	Have you had difficulty concentrating?	NO	YES
	d	Were you nervous or constantly on your guard?	NO	YES
	e	Were you easily startled?	NO	YES
		ARE **2** OR MORE **H5** ANSWERS CODED **YES**?	➡ NO	YES

H6	During the past month, have these problems significantly interfered with your work, school or social activities, or caused significant distress?	**NO** **YES** ***POSTTRAUMATIC STRESS DISORDER CURRENT***

I. ALCOHOL DEPENDENCE / ABUSE

(➡ MEANS: GO TO DIAGNOSTIC BOXES, CIRCLE NO IN BOTH AND MOVE TO THE NEXT MODULE)

		➡	
I1	**In the past 12 months**, have you had 3 or more alcoholic drinks, - within a 3 hour period, - on 3 or more occasions?	NO	YES

I2 **In the past 12 months**:

a	Did you need to drink a lot more in order to get the same effect that you got when you first started drinking or did you get much less effect with continued use of the same amount?	NO	YES
b	When you cut down on drinking did your hands shake, did you sweat or feel agitated? Did you drink to avoid these symptoms (for example, "the shakes", sweating or agitation) or to avoid being hungover? IF **YES** TO ANY, CODE **YES**.	NO	YES
c	During the times when you drank alcohol, did you end up drinking more than you planned when you started?	NO	YES
d	Have you tried to reduce or stop drinking alcohol but failed?	NO	YES
e	On the days that you drank, did you spend substantial time in obtaining alcohol, drinking, or in recovering from the effects of alcohol?	NO	YES
f	Did you spend less time working, enjoying hobbies, or being with others because of your drinking?	NO	YES
g	If your drinking caused you health or mental problems, did you still keep on drinking?	NO	YES

ARE **3** OR MORE **I2** ANSWERS CODED **YES**?

***** IF YES, SKIP I3 QUESTIONS AND GO TO NEXT MODULE. "DEPENDENCE PREEMPTS ABUSE" IN DSM IV TR.

NO	YES*
ALCOHOL DEPENDENCE **CURRENT**	

I3 **In the past 12 months:**

a	Have you been intoxicated, high, or hungover more than once when you had other responsibilities at school, at work, or at home? Did this cause any problems? (CODE **YES** ONLY IF THIS CAUSED PROBLEMS.)	NO	YES
b	Were you intoxicated more than once in any situation where you were physically at risk, for example, driving a car, riding a motorbike, using machinery, boating, etc.?	NO	YES
c	Did you have legal problems more than once because of your drinking, for example, an arrest or disorderly conduct?	NO	YES
d	If your drinking caused problems with your family or other people, did you still keep on drinking?	NO	YES

ARE **1** OR MORE **I3** ANSWERS CODED **YES**?

NO	YES
	ALCOHOL ABUSE **CURRENT**

J. SUBSTANCE DEPENDENCE / ABUSE (NON-ALCOHOL)

(➡ MEANS : GO TO THE DIAGNOSTIC BOXES, CIRCLE NO IN ALL DIAGNOSTIC BOXES, AND MOVE TO THE NEXT MODULE)

Now I am going to show you / read to you a list of street drugs or medicines.

			➡	
J1	a	**In the past 12 months**, did you take any of these drugs more than once, to get high, to feel elated, to get "a buzz" or to change your mood?	NO	YES

CIRCLE EACH DRUG TAKEN:

Stimulants: amphetamines, "speed", crystal meth, "crank", "rush", Dexedrine, Ritalin, diet pills.

Cocaine: snorting, IV, freebase, crack, "speedball".

Narcotics: heroin, morphine, Dilaudid, opium, Demerol, methadone, Darvon, codeine, Percodan, Vicoden, OxyContin.

Hallucinogens: LSD ("acid"), mescaline, peyote, psilocybin, STP, "mushrooms", "ecstasy", MDA, MDMA.

Phencyclidine: PCP ("Angel Dust", "PeaCe Pill", "Tranq", "Hog"), or ketamine ("special K").

Inhalants: "glue", ethyl chloride, "rush", nitrous oxide ("laughing gas"), amyl or butyl nitrate ("poppers").

Cannabis: marijuana, hashish ("hash"), THC, "pot", "grass", "weed", "reefer".

Tranquilizers: Quaalude, Seconal ("reds"), Valium, Xanax, Librium, Ativan, Dalmane, Halcion, barbiturates, Miltown, GHB, Roofinol, "Roofies".

Miscellaneous: steroids, nonprescription sleep or diet pills. Cough Medicine? Any others?

SPECIFY THE MOST USED DRUG(S): _____

WHICH DRUG(S) CAUSE THE BIGGEST PROBLEMS?: _____

FIRST EXPLORE THE DRUG CAUSING THE BIGGEST PROBLEMS AND MOST LIKELY TO MEET DEPENDENCE / ABUSE CRITERIA.

IF MEETS CRITERIA FOR ABUSE OR DEPENDENCE, SKIP TO THE NEXT MODULE. OTHERWISE, EXPLORE THE NEXT MOST PROBLEMATIC DRUG.

J2 **Considering your use of (NAME THE DRUG / DRUG CLASS SELECTED), in the past 12 months:**

	a	Have you found that you needed to use much more (NAME OF DRUG / DRUG CLASS SELECTED) to get the same effect that you did when you first started taking it?	NO	YES
	b	When you reduced or stopped using (NAME OF DRUG / DRUG CLASS SELECTED), did you have withdrawal symptoms (aches, shaking, fever, weakness, diarrhea, nausea, sweating, heart pounding, difficulty sleeping, or feeling agitated, anxious, irritable, or depressed)? Did you use any drug(s) to keep yourself from getting sick (withdrawal symptoms) or so that you would feel better?	NO	YES
		IF **YES** TO EITHER, CODE **YES**.		
	c	Have you often found that when you used (NAME OF DRUG / DRUG CLASS SELECTED), you ended up taking more than you thought you would?	NO	YES
	d	Have you tried to reduce or stop taking (NAME OF DRUG / DRUG CLASS SELECTED) but failed?	NO	YES
	e	On the days that you used (NAME OF DRUG / DRUG CLASS SELECTED), did you spend substantial time (>2 HOURS), obtaining, using or in recovering from the drug, or thinking about the drug?	NO	YES
	f	Did you spend less time working, enjoying hobbies, or being with family or friends because of your drug use?	NO	YES
	g	If (NAME OF DRUG / DRUG CLASS SELECTED) caused you health or mental problems, did you still keep on using it?	NO	YES

ARE **3** OR MORE **J2** ANSWERS CODED **YES**?

SPECIFY DRUG(S): _____

***** IF YES, SKIP J3 QUESTIONS, MOVE TO NEXT DISORDER.
"DEPENDENCE PREEMPTS ABUSE" IN DSM IV TR.

NO **YES ***

SUBSTANCE DEPENDENCE
CURRENT

Considering your use of (NAME THE DRUG CLASS SELECTED), in the past 12 months:

J3 a Have you been intoxicated, high, or hungover from (NAME OF DRUG / DRUG CLASS SELECTED) more than once, when you had other responsibilities at school, at work, or at home? Did this cause any problem? NO YES

(CODE **YES** ONLY IF THIS CAUSED PROBLEMS.)

b Have you been high or intoxicated from (NAME OF DRUG / DRUG CLASS SELECTED) more than once in any situation where you were physically at risk (for example, driving a car, riding a motorbike, using machinery, boating, etc.)? NO YES

c Did you have legal problems more than once because of your drug use, for example, an arrest or disorderly conduct? NO YES

d If (NAME OF DRUG / DRUG CLASS SELECTED) caused problems with your family or other people, did you still keep on using it? NO YES

ARE **1** OR MORE **J3** ANSWERS CODED **YES**?

SPECIFY DRUG(S): _____

NO **YES**

SUBSTANCE ABUSE
CURRENT

K. PSYCHOTIC DISORDERS AND MOOD DISORDER WITH PSYCHOTIC FEATURES

ASK FOR AN EXAMPLE OF EACH QUESTION ANSWERED POSITIVELY. CODE **YES** ONLY IF THE EXAMPLES CLEARLY SHOW A DISTORTION OF THOUGHT OR OF PERCEPTION OR IF THEY ARE NOT CULTURALLY APPROPRIATE. BEFORE CODING, INVESTIGATE WHETHER DELUSIONS QUALIFY AS "BIZARRE".

DELUSIONS ARE "BIZARRE" IF: CLEARLY IMPLAUSIBLE, ABSURD, NOT UNDERSTANDABLE, AND CANNOT DERIVE FROM ORDINARY LIFE EXPERIENCE.
HALLUCINATIONS ARE SCORED "BIZARRE" IF: A VOICE COMMENTS ON THE PERSON'S THOUGHTS OR BEHAVIOR, OR WHEN TWO OR MORE VOICES ARE CONVERSING WITH EACH OTHER.
THE PURPOSE OF THIS MODULE IS TO EXCLUDE PATIENTS WITH PSYCHOTIC DISORDERS. THIS MODULE NEEDS EXPERIENCE.

		Now I am going to ask you about unusual experiences that some people have.			BIZARRE
K1	a	Have you ever believed that people were spying on you, or that someone was plotting against you, or trying to hurt you? **NOTE**: ASK FOR EXAMPLES TO RULE OUT ACTUAL STALKING.	NO	YES	YES
	b	**IF YES OR YES BIZARRE:** do you currently believe these things?	NO	YES	YES →**K6**
K2	a	Have you ever believed that someone was reading your mind or could hear your thoughts, or that you could actually read someone's mind or hear what another person was thinking?	NO	YES	YES
	b	**IF YES OR YES BIZARRE:** do you currently believe these things?	NO	YES	YES →**K6**
K3	a	Have you ever believed that someone or some force outside of yourself put thoughts in your mind that were not your own, or made you act in a way that was not your usual self? Have you ever felt that you were possessed? CLINICIAN: ASK FOR EXAMPLES AND DISCOUNT ANY THAT ARE NOT PSYCHOTIC.	NO	YES	YES
	b	**IF YES OR YES BIZARRE:** do you currently believe these things?	NO	YES	YES →**K6**
K4	a	Have you ever believed that you were being sent special messages through the TV, radio, newspapers, books or magazines or that a person you did not personally know was particularly interested in you?	NO	YES	YES
	b	**IF YES OR YES BIZARRE:** do you currently believe these things?	NO	YES	YES →**K6**
K5	a	Have your relatives or friends ever considered any of your beliefs odd or unusual? INTERVIEWER**:** ASK FOR EXAMPLES. ONLY CODE **YES** IF THE EXAMPLES ARE **CLEARLY** DELUSIONAL IDEAS NOT EXPLORED IN QUESTIONS K1 TO K4, FOR EXAMPLE, SOMATIC OR RELIGIOUS DELUSIONS OR DELUSIONS OF GRANDIOSITY, JEALOUSY, GUILT, RUIN OR DESTITUTION, ETC.	NO	YES	YES
	b	**IF YES OR YES BIZARRE:** do they currently consider your beliefs strange?	NO	YES	YES
K6	a	Have you ever heard things other people couldn't hear, such as voices?	NO	YES	
		IF YES TO VOICE HALLUCINATION: Was the voice commenting on your thoughts or behavior or did you hear two or more voices talking to each other?	NO		YES
	b	**IF YES OR YES BIZARRE TO K6a:** have you heard sounds / voices in the past month?	NO	YES	
		IF YES TO VOICE HALLUCINATION: Was the voice commenting on your thoughts or behavior or did you hear two or more voices talking to each other?	NO		YES →**K8b**

K7 a Have you ever had visions when you were awake or have you ever seen things other people couldn't see? NO YES

CLINICIAN: CHECK TO SEE IF THESE ARE CULTURALLY INAPPROPRIATE.

b **IF YES:** have you seen these things in the past month? NO YES

CLINICIAN'S JUDGMENT

K8 b IS THE PATIENT CURRENTLY EXHIBITING INCOHERENCE, DISORGANIZED SPEECH, OR MARKED LOOSENING OF ASSOCIATIONS? NO YES

K9 b IS THE PATIENT CURRENTLY EXHIBITING DISORGANIZED OR CATATONIC BEHAVIOR? NO YES

K10 b ARE NEGATIVE SYMPTOMS OF SCHIZOPHRENIA, E.G. SIGNIFICANT AFFECTIVE FLATTENING, POVERTY OF SPEECH (ALOGIA) OR AN INABILITY TO INITIATE OR PERSIST IN GOAL-DIRECTED ACTIVITIES (AVOLITION), PROMINENT DURING THE INTERVIEW? NO YES

K11 a ARE 1 OR MORE « a » QUESTIONS FROM K1a TO K7a CODED **YES OR YES BIZARRE** AND IS EITHER:

MAJOR DEPRESSIVE EPISODE, (CURRENT, RECURRENT OR PAST)
OR
MANIC OR HYPOMANIC EPISODE, (CURRENT OR PAST) CODED **YES**? NO YES
↳ **K13**

IF NO TO K11 a, CIRCLE NO IN BOTH 'MOOD DISORDER WITH PSYCHOTIC FEATURES' DIAGNOSTIC BOXES AND MOVE TO K13.

b You told me earlier that you had period(s) when you felt (depressed/high/persistently irritable).

Were the beliefs and experiences you just described (SYMPTOMS CODED **YES** FROM **K1**a TO **K7**a) restricted exclusively to times when you were feeling depressed/high/irritable?

IF THE PATIENT EVER HAD A PERIOD OF AT LEAST 2 WEEKS OF HAVING THESE BELIEFS OR EXPERIENCES (PSYCHOTIC SYMPTOMS) WHEN THEY WERE NOT DEPRESSED/HIGH/IRRITABLE, CODE NO TO THIS DISORDER.

IF THE ANSWER IS NO TO THIS DISORDER, ALSO CIRCLE NO TO K12 AND MOVE TO K13

NO **YES**

MOOD DISORDER WITH *PSYCHOTIC FEATURES*

LIFETIME

K12 a ARE 1 OR MORE « b » QUESTIONS FROM K1b TO K7b CODED **YES OR YES BIZARRE** AND IS EITHER:

MAJOR DEPRESSIVE EPISODE, (CURRENT)
OR
MANIC OR HYPOMANIC EPISODE, (CURRENT) CODED **YES**?

IF THE ANSWER IS YES TO THIS DISORDER (LIFETIME OR CURRENT), CIRCLE NO TO K13 AND K14 AND MOVE TO THE NEXT MODULE.

NO **YES**

MOOD DISORDER WITH *PSYCHOTIC FEATURES*

CURRENT

K13 ARE 1 OR MORE « b » QUESTIONS FROM K1b TO K6b, CODED **YES BIZARRE**?

OR

ARE 2 OR MORE « b » QUESTIONS FROM K1b TO K10b, CODED **YES** (RATHER THAN **YES BIZARRE**)?

AND DID AT LEAST TWO OF THE PSYCHOTIC SYMPTOMS OCCUR DURING THE SAME 1 MONTH PERIOD?

NO **YES**

PSYCHOTIC DISORDER
CURRENT

K14 IS **K13** CODED **YES**

OR

ARE 1 OR MORE « a » QUESTIONS FROM K1a TO K6a, CODED **YES BIZARRE**?

OR

ARE 2 OR MORE « a » QUESTIONS FROM K1a TO K7a, CODED **YES** (RATHER THAN **YES BIZARRE**)

AND DID AT LEAST TWO OF THE PSYCHOTIC SYMPTOMS OCCUR DURING THE SAME 1 MONTH PERIOD?

NO **YES**

PSYCHOTIC DISORDER
LIFETIME

L. ANOREXIA NERVOSA

(➡ MEANS : GO TO THE DIAGNOSTIC BOX, CIRCLE NO, AND MOVE TO THE NEXT MODULE)

L1	a	How tall are you?	❑ ft ❑❑ in. ❑❑❑ cm.
	b.	What was your lowest weight in the past 3 months?	❑❑❑ lbs. ❑❑❑ kgs.
	c	IS PATIENT'S WEIGHT EQUAL TO OR BELOW THE THRESHOLD CORRESPONDING TO HIS / HER HEIGHT? (SEE TABLE BELOW)	➡ NO YES

In the past 3 months:

L2		In spite of this low weight, have you tried not to gain weight?	➡ NO YES
L3		Have you intensely feared gaining weight or becoming fat, even though you were underweight?	➡ NO YES
L4	a	Have you considered yourself too big / fat or that part of your body was too big / fat?	NO YES
	b	Has your body weight or shape greatly influenced how you felt about yourself?	NO YES
	c	Have you thought that your current low body weight was normal or excessive?	NO YES
L5		ARE 1 OR MORE ITEMS FROM **L4** CODED **YES**?	➡ NO YES
L6		FOR WOMEN ONLY: During the last 3 months, did you miss all your menstrual periods when they were expected to occur (when you were not pregnant)?	➡ NO YES

FOR WOMEN: ARE **L5 AND L6** CODED **YES**?

FOR MEN: IS **L5** CODED **YES**?

NO YES

ANOREXIA NERVOSA
CURRENT

HEIGHT / WEIGHT TABLE CORRESPONDING TO A BMI THRESHOLD OF 17.5 KG/M^2

Height/Weight														
ft/in	4'9	4'10	4'11	5'0	5'1	5'2	5'3	5'4	5'5	5'6	5'7	5'8	5'9	5'10
lbs.	81	84	87	89	92	96	99	102	105	108	112	115	118	122
cm	145	147	150	152	155	158	160	163	165	168	170	173	175	178
kgs	37	38	39	41	42	43	45	46	48	49	51	52	54	55

Height/Weight					
ft/in	5'11	6'0	6'1	6'2	6'3
lbs.	125	129	132	136	140
cm	180	183	185	188	191
kgs	57	59	60	62	64

The weight thresholds above are calculated using a body mass index (BMI) equal to or below 17.5 kg/m^2 for the patient's height. This is the threshold guideline below which a person is deemed underweight by the DSM-IV and the ICD-10 Diagnostic Criteria for Research for Anorexia Nervosa.

M. BULIMIA NERVOSA

(➡ MEANS : GO TO THE DIAGNOSTIC BOXES, CIRCLE NO IN ALL DIAGNOSTIC BOXES, AND MOVE TO THE NEXT MODULE)

M1	In the past three months, did you have eating binges or times when you ate a very large amount of food within a 2-hour period?	➡ NO	YES
M2	In the last 3 months, did you have eating binges as often as twice a week?	➡ NO	YES
M3	During these binges, did you feel that your eating was out of control?	➡ NO	YES
M4	Did you do anything to compensate for, or to prevent a weight gain from these binges, like vomiting, fasting, exercising or taking laxatives, enemas, diuretics (fluid pills), or other medications?	➡ NO	YES
M5	Does your body weight or shape greatly influence how you feel about yourself?	➡ NO	YES
M6	DO THE PATIENT'S SYMPTOMS MEET CRITERIA FOR ANOREXIA NERVOSA?	NO ↓ Skip to M8	YES
M7	Do these binges occur only when you are under (____lbs./kgs.)? INTERVIEWER: WRITE IN THE ABOVE PARENTHESIS THE THRESHOLD WEIGHT FOR THIS PATIENT'S HEIGHT FROM THE HEIGHT / WEIGHT TABLE IN THE ANOREXIA NERVOSA MODULE.	NO	YES

M8 IS **M5** CODED **YES** AND IS EITHER **M6** OR **M7** CODED **NO**?

NO **YES**

BULIMIA NERVOSA
CURRENT

IS **M7** CODED **YES**?

NO **YES**

ANOREXIA NERVOSA
Binge Eating/Purging Type
CURRENT

N. GENERALIZED ANXIETY DISORDER

(➡ MEANS : GO TO THE DIAGNOSTIC BOX, CIRCLE NO, AND MOVE TO THE NEXT MODULE)

N1	a	Were you excessively anxious or worried about several routine things, over the past 6 months? IN ENGLISH, IF THE PATIENT IS UNCLEAR ABOUT WHAT YOU MEAN, PROBE BY ASKING (Do others think that you are a "worry wart") AND GET EXAMPLES.	➡ NO	YES
	b	Are these anxieties and worries present most days?	➡ NO	YES
		ARE THE PATIENT'S ANXIETY AND WORRIES RESTRICTED EXCLUSIVELY TO, OR BETTER EXPLAINED BY, ANY DISORDER PRIOR TO THIS POINT?	NO	➡ YES
N2		Do you find it difficult to control the worries?	➡ NO	YES
N3		FOR THE FOLLOWING, CODE **NO** IF THE SYMPTOMS ARE CONFINED TO FEATURES OF ANY DISORDER EXPLORED PRIOR TO THIS POINT**.**		
		When you were anxious over the past 6 months, did you, most of the time:		
	a	Feel restless, keyed up or on edge?	NO	YES
	b	Have muscle tension?	NO	YES
	c	Feel tired, weak or exhausted easily?	NO	YES
	d	Have difficulty concentrating or find your mind going blank?	NO	YES
	e	Feel irritable?	NO	YES
	f	Have difficulty sleeping (difficulty falling asleep, waking up in the middle of the night, early morning wakening or sleeping excessively)?	NO	YES
		ARE **3** OR MORE **N3** ANSWERS CODED **YES?**	➡ NO	YES
N4		Do these anxieties and worries disrupt your normal work, school or social functioning or cause you significant distress?	**NO**	**YES**

GENERALIZED ANXIETY DISORDER
CURRENT

O. RULE OUT MEDICAL, ORGANIC OR DRUG CAUSES FOR ALL DISORDERS

IF THE PATIENT CODES POSITIVE FOR ANY CURRENT DISORDER ASK:

Just before these symptoms began:

O1a	Were you taking any drugs or medicines?	❒ No	❒ Yes	❒ Uncertain
O1b	Did you have any medical illness?	❒ No	❒ Yes	❒ Uncertain

IN THE CLINICIAN'S JUDGMENT: ARE EITHER OF THESE LIKELY TO BE DIRECT CAUSES OF THE PATIENT'S DISORDER?
IF NECESSARY ASK ADDITIONAL OPEN-ENDED QUESTIONS.

O2	**SUMMARY**: HAS AN ORGANIC CAUSE BEEN RULED OUT?	❒ No	❒ Yes	❒ Uncertain

P. ANTISOCIAL PERSONALITY DISORDER

(➡ MEANS : GO TO THE DIAGNOSTIC BOX AND CIRCLE NO)

P1 **Before you were 15 years old, did you:**

a	repeatedly skip school or run away from home overnight?	NO	YES
b	repeatedly lie, cheat, "con" others, or steal?	NO	YES
c	start fights or bully, threaten, or intimidate others?	NO	YES
d	deliberately destroy things or start fires?	NO	YES
e	deliberately hurt animals or people?	NO	YES
f	force someone to have sex with you?	NO	YES

➡

ARE **2** OR MORE **P1** ANSWERS CODED **YES**? NO YES

DO NOT CODE **YES** TO THE BEHAVIORS BELOW IF THEY ARE EXCLUSIVELY POLITICALLY OR RELIGIOUSLY MOTIVATED**.**

P2 **Since you were 15 years old, have you:**

a	repeatedly behaved in a way that others would consider irresponsible, like failing to pay for things you owed, deliberately being impulsive or deliberately not working to support yourself?	NO	YES
b	done things that are illegal even if you didn't get caught (for example, destroying property, shoplifting, stealing, selling drugs, or committing a felony)?	NO	YES
c	been in physical fights repeatedly (including physical fights with your spouse or children)?	NO	YES
d	often lied or "conned" other people to get money or pleasure, or lied just for fun?	NO	YES
e	exposed others to danger without caring?	NO	YES
f	felt no guilt after hurting, mistreating, lying to, or stealing from others, or after damaging property?	NO	YES

ARE **3** OR MORE **P2** QUESTIONS CODED **YES**?

NO **YES**

ANTISOCIAL PERSONALITY DISORDER
LIFETIME

THIS CONCLUDES THE INTERVIEW

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MOOD DISORDERS: DIAGNOSTIC ALGORITHM

Consult Modules:
- A Major Depressive Episode
- C (Hypo) manic Episode
- K Psychotic Disorders

MODULE K:

1a	IS **K11b** CODED YES?	NO	YES
1b	IS **K12a** CODED YES?	NO	YES

MODULES A and C:		Current	Past
2 a	CIRCLE YES IF A DELUSIONAL IDEA IS IDENTIFIED IN **A3e**?	YES	YES
b	CIRCLE YES IF A DELUSIONAL IDEA IS IDENTIFIED IN **C3a**?	YES	YES

c Is a Major Depressive Episode coded YES (current or past)?
and
is Manic Episode coded NO (current and past)?
and
is Hypomanic Episode coded NO (current and past)?
and
is **"**Hypomanic Symptoms" coded NO (current and past)?

Specify:
- If the depressive episode is **current** or **past** or both
- **With Psychotic Features** Current: If 1b or 2a (current) = YES
  With Psychotic Features Past: If 1a or 2a (past) = YES

MAJOR DEPRESSIVE DISORDER

	current	past
MDD	❑	❑

With Psychotic Features

Current	❑
Past	❑

d Is a Manic Episode coded YES (current or past)?

Specify:
- If the Bipolar I Disorder is **current** or **past** or both
- With **Single Manic Episode**: If Manic episode (current or past) = YES
  and MDE (current and past) = NO
- **With Psychotic Features** Current: If 1b or 2a (current) or 2b (current) = YES
  With Psychotic Features Past: If 1a or 2a (past) or 2b (past) = YES
- If the **most recent episode** is manic, depressed,
  mixed or hypomanic or unspecified (all mutually exclusive)
- **Unspecified** if the Past Manic Episode is coded YES AND
  Current (C3 Summary AND C4a AND C6 AND O2) are coded YES

BIPOLAR I DISORDER

	current	past
Bipolar I Disorder	❑	❑
Single Manic Episode	❑	❑

With Psychotic Features

Current	❑
Past	❑

Most Recent Episode

Manic	❑
Depressed	❑
Mixed	❑
Hypomanic	❑
Unspecified	❑

e Is Major Depressive Episode coded YES (current or past)?
and
Is Hypomanic Episode coded YES (current or past)?
and
Is Manic Episode coded NO (current and past)?

Specify:

- If the Bipolar Disorder is **current** or **past** or both
- If the most recent mood episode is **hypomanic** or **depressed** (mutually exclusive)

BIPOLAR II DISORDER

	current	past
Bipolar II Disorder	❑	❑

Most Recent Episode

Hypomanic	❑
Depressed	❑

f Is MDE coded NO (current and past)
and
Is Manic Episode coded NO (current and past)?
and is either:

1) C7b coded YES for the appropriate time frame?

or

2) C3 Summary coded YES for the appropriate time frame?
and
C4a coded YES for the appropriate time frame?
and
C7c coded YES for the appropriate time frame?

Specify if the Bipolar Disorder NOS is **current** or **past** or both

BIPOLAR DISORDER NOS

	current	past
Bipolar Disorder NOS	❑	❑

M.I.N.I. PLUS

The shaded modules below are additional modules available in the MINI PLUS beyond what is available in the standard MINI. The un-shaded modules below are in the standard MINI.

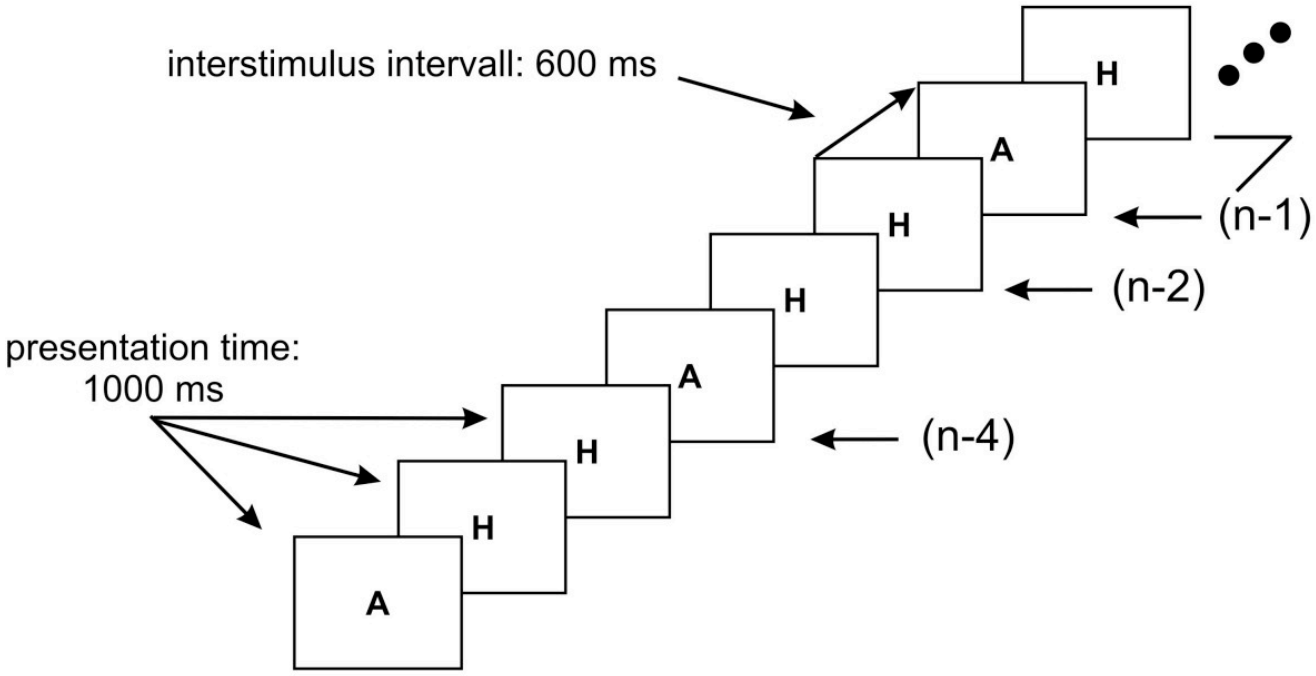
These MINI PLUS modules can be inserted into or used in place of the standard MINI modules, as dictated by the specific needs of any study.

	MODULES	TIME FRAME
A	MAJOR DEPRESSIVE EPISODE	Current (2 weeks) Past Recurrent
	MOOD DISORDER DUE TO A GENERAL MEDICAL CONDITION	Current Past
	SUBSTANCE INDUCED MOOD DISORDER	Current Past
	MDE WITH MELANCHOLIC FEATURES	Current (2 weeks)
	MDE WITH ATYPICAL FEATURES	Current (2 weeks)
	MDE WITH CATATONIC FEATURES	Current (2 weeks)
B	DYSTHYMIA	Current (Past 2 years) Past
C	SUICIDALITY	Current (Past Month) Risk: ❑ Low ❑ Medium ❑ High
D	MANIC EPISODE	Current Past
	HYPOMANIC EPISODE	Current Past
	BIPOLAR I DISORDER	Current Past
	BIPOLAR II DISORDER	Current Past
	BIPOLAR DISORDER NOS	Current Past
	MANIC EPISODE DUE TO A GENERAL MEDICAL CONDITION	Current Past
	HYPOMANIC EPISODE DUE TO A GENERAL MEDICAL CONDITION	Current Past
	SUBSTANCE INDUCED MANIC EPISODE	Current Past
	SUBSTANCE INDUCED HYPOMANIC EPISODE	Current Past
E	PANIC DISORDER	Current (Past Month) Lifetime
	ANXIETY DISORDER WITH PANIC ATTACKS DUE TO A GENERAL MEDICAL CONDITION	Current
	SUBSTANCE INDUCED ANXIETY DISORDER WITH PANIC ATTACKS	Current
F	AGORAPHOBIA	Current
G	SOCIAL PHOBIA (Social Anxiety Disorder)	Current (Past Month)
H	SPECIFIC PHOBIA	Current
I	OBSESSIVE-COMPULSIVE DISORDER	Current (Past Month)
	OCD DUE TO A GENERAL MEDICAL CONDITION	Current
	SUBSTANCE INDUCED OCD	Current
J	POSTTRAUMATIC STRESS DISORDER	Current (Past Month)
K	ALCOHOL DEPENDENCE	Past 12 Months
	ALCOHOL DEPENDENCE	Lifetime
	ALCOHOL ABUSE	Past 12 Months
	ALCOHOL ABUSE	Lifetime
L	SUBSTANCE DEPENDENCE (Non-alcohol)	Past 12 Months
	SUBSTANCE DEPENDENCE (Non-alcohol)	Lifetime
	SUBSTANCE ABUSE (Non-alcohol)	Past 12 Months

M	PSYCHOTIC DISORDERS	Lifetime
		Current
	MOOD DISORDER WITH PSYCHOTIC FEATURES	Current
	SCHIZOPHRENIA	Current
		Lifetime
	SCHIZOAFFECTIVE DISORDER	Current
		Lifetime
	SCHIZOPHRENIFORM DISORDER	Current
		Lifetime
	BRIEF PSYCHOTIC DISORDER	Current
		Lifetime
	DELUSIONAL DISORDER	Current
		Lifetime
	PSYCHOTIC DISORDER DUE TO A GENERAL MEDICAL CONDITION	Current
		Lifetime
	SUBSTANCE INDUCED PSYCHOTIC DISORDER	Current
		Lifetime
	PSYCHOTIC DISORDER NOS	Current
		Lifetime
	MOOD DISORDER WITH PSYCHOTIC FEATURES	Lifetime
	MOOD DISORDER NOS	Lifetime
	MAJOR DEPRESSIVE DISORDER WITH PSYCHOTIC FEATURES	Current
		Past
	BIPOLAR I DISORDER WITH PSYCHOTIC FEATURES	Current
		Past
N	ANOREXIA NERVOSA	Current (Past 3 Months)
O	BULIMIA NERVOSA	Current (Past 3 Months)
	BULIMIA NERVOSA PURGING TYPE	Current
	BULIMIA NERVOSA NONPURGING TYPE	Current
	ANOREXIA NERVOSA, BINGE EATING/PURGING TYPE	Current
	ANOREXIA NERVOSA, RESTRICTING TYPE	Current
P	GENERALIZED ANXIETY DISORDER	Current (Past 6 Months)
	GENERALIZED ANXIETY DISORDER DUE TO A GENERAL MEDICAL CONDITION	Current
	SUBSTANCE INDUCED GAD	Current
Q	ANTISOCIAL PERSONALITY DISORDER	Lifetime
R	SOMATIZATION DISORDER	Lifetime
		Current
S	HYPOCHONDRIASIS	Current
T	BODY DYSMORPHIC DISORDER	Current
U	PAIN DISORDER	Current
V	CONDUCT DISORDER	Past 12 Months
W	ATTENTION DEFICIT/HYPERACTIVITY DISORDER (Children/Adolescents)	Past 6 Months
	ATTENTION DEFICIT/HYPERACTIVITY DISORDER (Adults)	Lifetime
		Current
X	ADJUSTMENT DISORDERS	Current
Y	PREMENSTRUAL DYSPHORIC DISORDER	Current
Z	MIXED ANXIETY-DEPRESSIVE DISORDER	Current

Multi-Source Interference Task (MSIT)

N-back task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Subject Number_____ Date_____

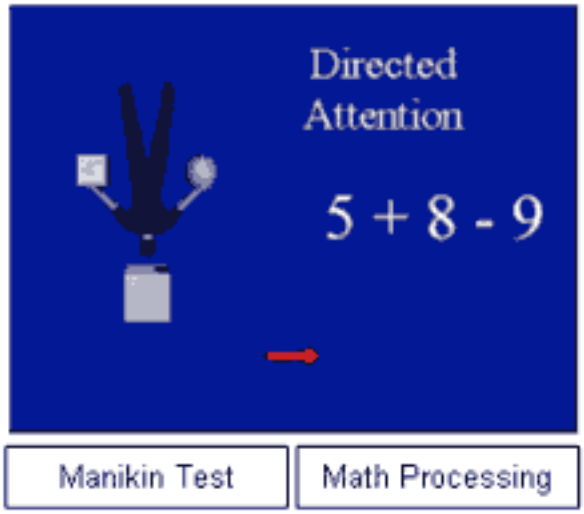
Please put an **X** next to the statement that best describes how you feel:

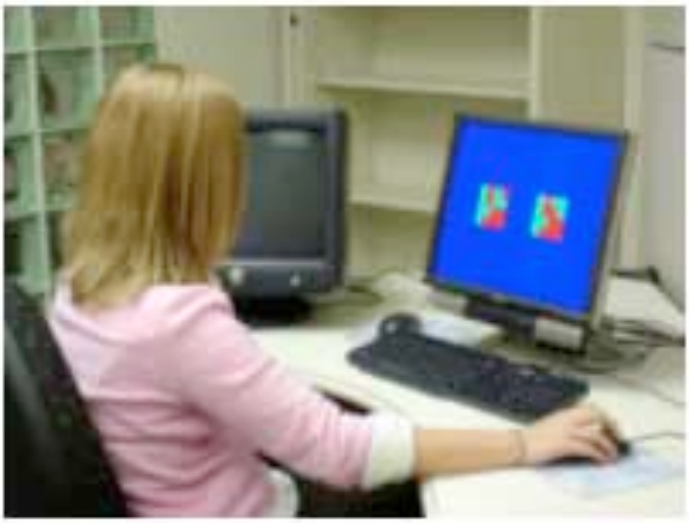
Right now I am:

- ☐ Feeling active, vital, alert or wide awake
- ☐ Functioning at high levels, but not at peak; able to concentrate
- ☐ Awake, but relaxed; responsive but not fully alert
- ☐ Somewhat foggy, let down
- ☐ Foggy; losing interest in remaining awake; slowed down
- ☐ Sleepy, woozy, fighting sleep; prefer to lie down
- ☐ No longer fighting sleep, sleep onset soon; having dream-like thoughts
- ❖ Asleep


RBANS
Repeatable Battery for the Assessment of Neuropsychological Status
Manual
Christopher Randolph
RBANS
Stimulus Booklet A
Christopher Randolph
RBANS
RBANS
RBANS

Automated Neuropsychological Assessment Metrics (ANAM4)





Psychomotor Vigilance Test

Press the spacebar every time an “x” appears on the screen.

BRIGHT LIGHT

10-20 PSG electrode attachments

Subject ID: _____ Date: _____

	Measure	cm	Electrode	Distance	cm	Completed
1	Nasion to Inion		**CZ**	midpoint		
			FP	10% from nasion		
			OZ	10% from inion		
2	Preaurical to preaurical		**CZ**	midpoint		
			C3 & C4	20% from midpoint		
3	Head Circumference (through FP and OZ)		**FP1 & FP2**	5% to each side of FP		
			O1 & O2	5% to each side of OZ		
4	FP1 to C3		**F3**	50% from C3		
5	FP2 to C4		**F4**	50% from C4		
6	Reference		**A1 & A2**			
7	Chins (EMG)		**EMG1 & EMG2**			

Bio Calibrations

	Instruction	Code	Duration	MSLT 1 Completed	MSLT 2 Completed	MSLT 3 Completed
1	Rest with eyes open	EO	1 min (2 epochs)			
2	Rest with eyes closed	EC	1 min (2 epochs)			
3	Look up and down	U/D	30 sec (1 epoch)			
4	Look left and right	L/R	30 sec (1 epoch)			
5	Blink 5 times	Blink	5 blinks (1 epoch)			
6	Grit teeth	Teeth	30 sec (1 epoch)			

	MSLT 1	MSLT 2	MSLT 3
Lights out epoch			
Wake time epoch			

Subject: _____ Date:_____

Read the following scenarios. Each scenario presents a situation and asks a question about the chance or likelihood that you would experience a particular outcome. For each one, think about how likely that outcome would be for YOU in that situation. Do NOT worry about how most people would do in a particular situation—just think about the chance that a particular outcome would happen to YOU in that situation. Circle the percent chance that best represents the probability that the outcome would happen to YOU.

1. You arrive 25 minutes late for a big job interview. What is the probability that YOU will get the job?

   0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

2. If you were to find yourself confronted by a vicious angry dog, what is the probability that YOU could get away unharmed?

   0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

3. Regardless of your moral convictions, if you were to shoplift a pair of $50 sunglasses from a chain drug store, what is the probability that YOU could get away with it without being caught?

   0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

4. While leaving a popular night club, you are attacked by a drunk man in his early 20s wielding a 10 inch knife. During the scuffle, your friend is stabbed, but not fatally. What is the chance that YOU will be killed during the attack?

   0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

5. While on vacation, you meet up with a stranger asking for help. Although the story the stranger tells you is heart wrenching and he seems very sincere, you are aware that he may just be a con-artist trying to scam you. If the stranger truly is a con-artist, what is the probability YOU will end up being scammed out of some of your money?

   0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

6. You awaken one morning realizing that you engaged in unprotected sex with someone you just met. Now that the alcohol has worn off, your partner remorsefully tells you that he/she has suffered for a long time with a very serious sexually transmitted disease. What is the chance that YOU will contract the sexually transmitted disease yourself after this contact?

   0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

7. While on vacation in a far away country, your 3 traveling companions have all contracted a bad case of diarrhea after drinking the water. You realize that you just drank some of the same water about an hour ago. What is the likelihood that YOU will come down with diarrhea too?

   0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

8. While on vacation in the woods, you decide to go hiking in an unfamiliar and thickly wooded area without a map or guide. What is the likelihood that YOU will get lost?

   0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

9. You have been at a nightclub for 4 hours. During that time you have had 7 alcoholic beverages. You are feeling a little "buzzed" but you decide to drive yourself home anyway because it is only about 5 miles away. What is the probability that YOU will make it home without any negative incident?

   0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

10. While playing golf one afternoon a thunderstorm comes up quickly. There is much wind and occasional lightning is hitting nearby. Because you are winning the game and only have two more holes to play, you decide to continue to the end. What is the likelihood that YOU will be struck by lightning before finishing the game?

    0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

11. While at your job you discover that one of your superiors has been embezzling large amounts of money from your organization. You decide to inform higher management of his illegal behavior. What is the chance that YOUR future career at the company will be harmed by reporting him?

    0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

12. Your company has a strict policy forbidding the removal of computer equipment from the work premises. However, you have a big project due that can only be completed if you "borrow" a company laptop computer over the weekend. What is the probability that YOU could secretly remove the computer for the weekend and return it to work on Monday without ever being caught?

    0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

13. You are a foreigner living in a war-torn country that is filled with violence and frequent sniper attacks. Although it is dark outside and there are many hostile insurgents in the area, you decide to drive alone and unarmed down a 10 mile stretch of empty highway to spend the weekend in the next town. What is the probability that YOU will be killed while making the trip?

    0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

14. While staying at a high rise hotel a bad fire breaks out several floors below yours. After hearing the fire alarm and smelling smoke, you quickly devise a plan of escape. What is the likelihood that YOU would be unable to figure out a way to escape and would die in the fire?

    0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

15. A severe natural disaster has devastated your town, resulting in widespread panic, looting, and deadly violence. The escape routes leading from the town are blocked with gridlock traffic and street gangs are killing at random and using violent means to steal limited necessities and survive. What is the chance that YOU will be able to outmaneuver the looters and escape the town unharmed?

    0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

16. You enter a competition in an arena in which you are particularly talented. What is the chance that YOU will ultimately win the competition?

    0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

17. You are sightseeing off a tall bridge where many individuals have tried to commit suicide by jumping to their deaths in the water below. Approximately half of all jumpers have not survived the long drop into the bay. Unfortunately, you stumble and are accidentally knocked off of the bridge. What is the likelihood that YOU would die in the fall?

    0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

18. Your biggest rival has challenged you in some way. What is the likelihood that YOU will ultimately defeat your rival at whatever he/she has challenged you with?

    0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

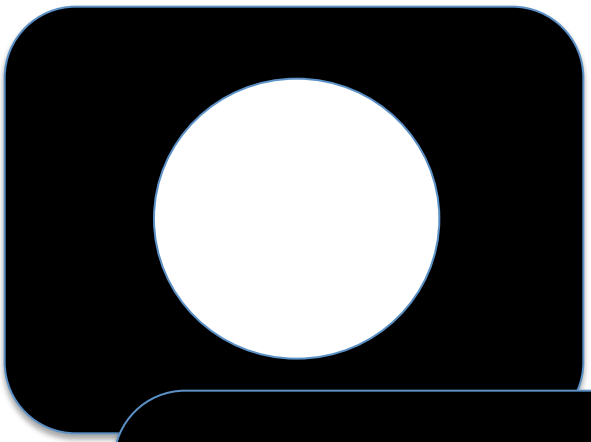
19. A bad automobile accident has just occurred in front of you. In one of the cars, the driver is unconscious and bleeding. You smell gas and notice that smoke is starting to billow out from the car. Afraid that the car may explode at any moment, you work to pull the unconscious driver from the car. What is the chance that YOU will die in the process of saving the driver?

    0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

20. While on vacation on a tropical island you decided to rent a small motor boat to do some sightseeing and fishing out along the island coast. After stopping the boat some distance from the shore you lay down to take a brief nap. Upon awakening you realize that you can no longer see the shore and notice that there is a fierce storm coming. What is the likelihood that YOU will die at sea?

    0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Go/No-Go Task



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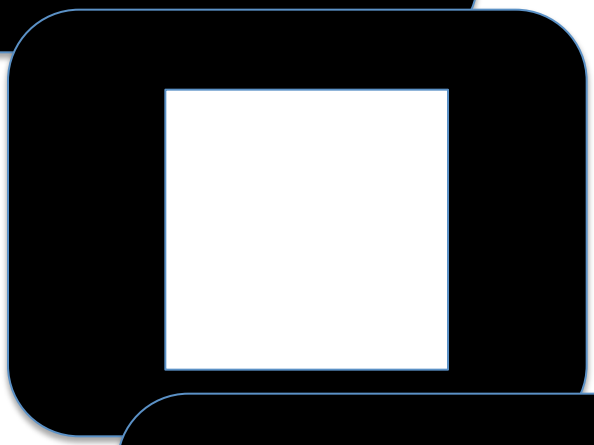

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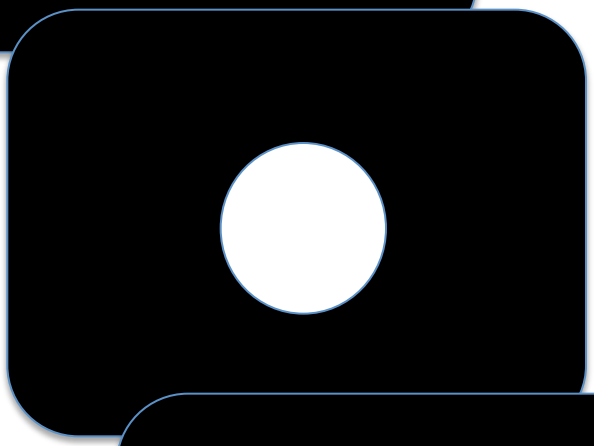

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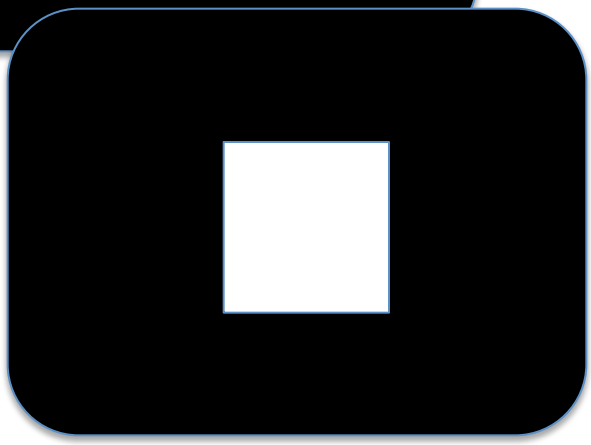
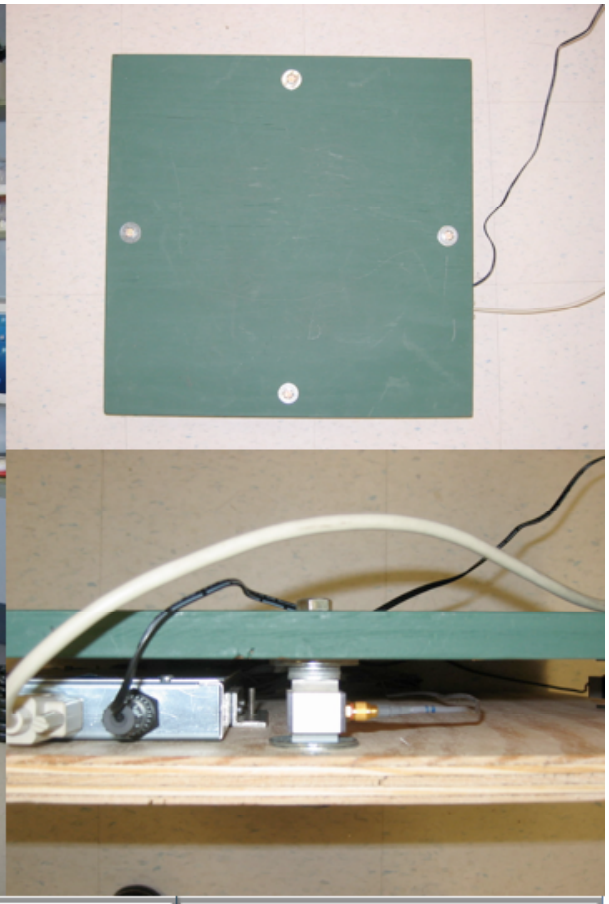
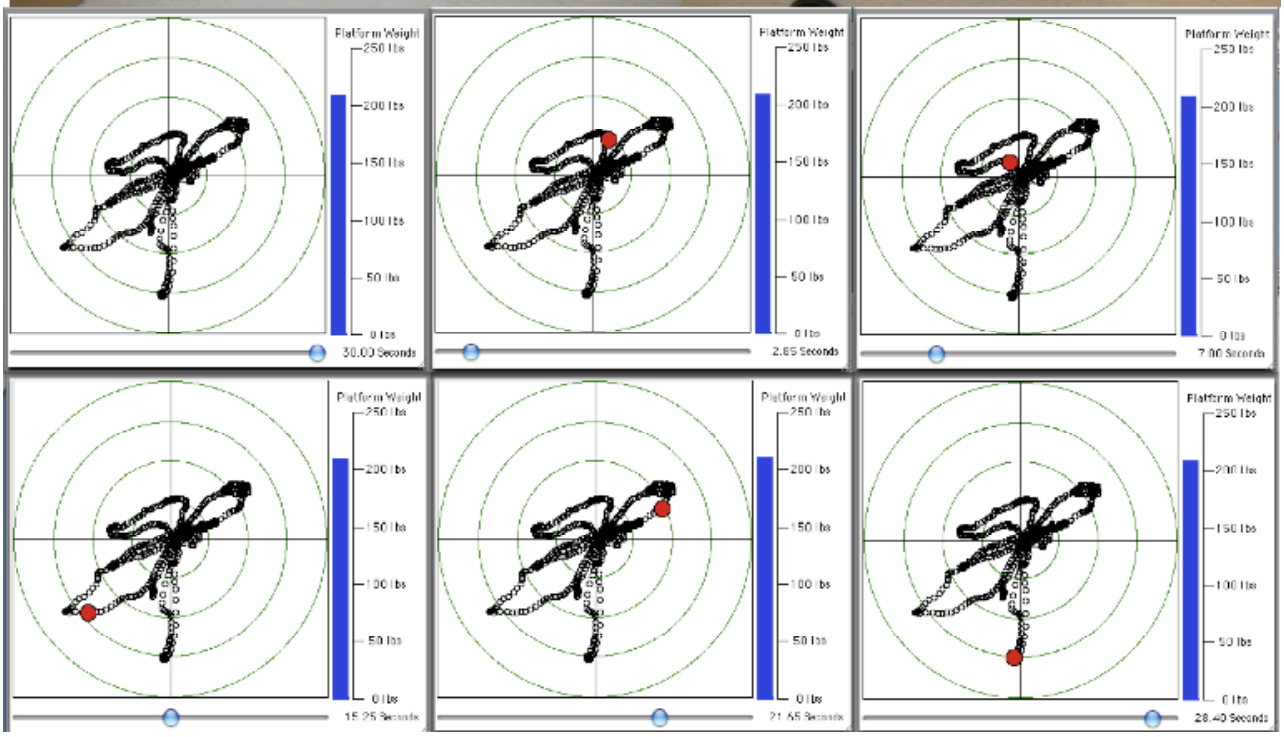


No Go

Body Sway and Stability Test





Day of Scan Information Questionnaire

Subject #: _____ Date: _____

DATE OF BIRTH _____/_____/_____
day month year

AGE ..... _____ years
HEIGHT ..... _____ ft/inches
WEIGHT ..... _____ lbs
SEX ..... **Male Female**

RIGHT or LEFT-HANDED? ..... **RIGHT LEFT BOTH/NEITHER**

How far did you go in school?
<9th; 9th; 10th; 11th; HS Grad; 2yr College; College Grad; Some Grad School; Masters, Doctorate

Do you have any problems with reading? NO YES _____

What is your primary language (what do you speak at home most of the time)?

English Spanish Other _____

CAFFEINE USE
Did you have any caffeine containing products today? If so, how much? _____
On average, how many cups of caffeinated coffee do you drink per day? _____
On average, how many cups of caffeinated tea do you drink per day? _____
On average, how many cans of caffeinated soda do you drink per day? _____
On average, how many caffeinated sports drinks do you drink per day? _____(brand)
Do you use any other caffeinated products, such as Vivarin? **YES NO**
If YES, **WHAT**? _____ How much?_____ How often? _____

NICOTINE USE
Do you smoke cigarettes? **YES NO**
If **YES**, about how many cigarettes do you smoke per day? _____
How long have you been smoking? _____ **years** _____ **months**
Have you tried to quit? **YES NO**
If **YES**, how many times? _____
If **NO**, did you ever smoke cigarettes in the past? **YES NO**
If **YES**, how many cigarettes did you smoke per day? _____
When did you start smoking? _____ (date)
When did you quit? _____ (date)
Do you use smokeless tobacco, such as dip or chew? **YES NO**
If **YES**, about how much do you use per day? _____
If **NO**, did you ever use smokeless tobacco in the past? **YES NO**
If **YES**, how much did you use per day? _____
When did you start using? _____ (year)
When did you quit? _____ (year)

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2010p-001570 08/21/2012 - 05/21/2013

Do you use any other nicotine-containing products? **YES NO**
If YES, **WHAT**? _____ How much?_____ How often? _____

OTHER

Do you take diet pills? **YES NO**
If **YES**, what brand? _____ How much?_____ How often?
Are you currently taking any medications, vitamins, or supplements? **YES NO**
If **YES**, please list:
Name: _____ Dosage: _____
Name: _____ Dosage: _____
Name: _____ Dosage: _____
Name: _____ Dosage: _____
How many times per month do you drink (alcohol)? _____
On those occasions, what is the average number of drinks you consume? _____
On those occasions, what is the largest number of drinks you consume? _____
How many times in the past year have you used marijuana? _____
Have you ever used marijuana at other times in your life? **YES NO**
If **YES**, at what age did you begin smoking marijuana? _____
On approximately how many occasions have you used marijuana? _____
Do you use any other street drugs currently or in the past year? **YES NO**
If YES, **WHAT**? _____ How much?_____ How often? _____

PHYSICAL INFORMATION

If female, when was the start of your last menstrual period (be as precise as possible)?
Date of period:_____ or about _____days ago.

CONCUSSION INFORMATION

How many "concussions" have you had in your life? _____
Did you lose consciousness or get "knocked out" each time? _____
How long ago was your most recent concussion? _____ Date it happened: _____
Briefly describe the situation that led to your most recent concussion:
_____
_____

Did you "see stars" during your last concussion? **YES NO**
Did you lose consciousness during your last concussion? **YES NO**
(If "YES", for how long were you unconscious: _____)
Did you notice that your sleep became worse following the concussion? **YES NO**
After your concussion, what sleep problems became more noticeable to you? (check all that apply)
_____ I get sleepier during the day
_____ I get drowsier than I used to when trying to concentrate or work
_____ I fall asleep when I should not
_____ It is harder to stay alert during the day
_____ It is harder to fall asleep at night
_____ I fall asleep much later than I used to
_____ I fall asleep much earlier than I used to
_____ I sleep later in the morning than I used to
_____ I wake up much earlier in the morning than I used to

_____ When I do sleep, it is fitful or less restful than it used to be
_____ I wake up off and on throughout the night more than I used to
_____ I have more nightmares than I used to

In the months **BEFORE** your concussion occurred:

Before your concussion, at what time did you normally go to bed at night on:
Week nights (Sun-Thur)? _____ AM PM (midnight = 12 AM; noon = 12 PM)
weekends (Fri-Sat)? _____ AM PM

Before your concussion, what time did you typically awaken on:
weekdays (Mon-Fri)? _____ AM PM
weekends (Sat-Sun)? _____ AM PM

Before your concussion, how long did it typically take you to fall asleep at night?
on week nights (Sun-Thur)? _____ MIN HRS
on weekends (Fri-Sat)? _____ MIN HRS

CURRENT SLEEP HABITS

How much sleep did you get last night? _____

Since your concussion, how much do you typically sleep on weeknights (Sun-Thur)? _____

Since your concussion, how much do you typically sleep on weekend nights (Fri-Sat)?_____

Since your concussion, at what time do you normally go to bed at night on:
week nights (Sun-Thur)? _____ AM PM (midnight = 12 AM; noon = 12 PM)
weekends (Fri-Sat)? _____ AM PM

Since your concussion, what time do you typically awaken on:
weekdays (Mon-Fri)? _____ AM PM
weekends (Sat-Sun)? _____ AM PM

Since your concussion, how long does it typically take you to fall asleep at night?
on week nights (Sun-Thur)? _____ MIN HRS
on weekends (Fri-Sat)? _____ MIN HRS

Since your concussion, at what time of day do you feel sleepiest? _____ AM PM
At what time of day do you feel most alert? _____ AM PM

Since your concussion, how many hours do you need to sleep to feel your best? _____

"Since your concussion…"
"If I get less than _____ hours of sleep, I notice an impairment in my ability to function at work."
"If I get more than _____ hours of sleep, I notice an impairment in my ability to function at work."

Is daytime sleepiness currently a problem for you? .....**YES NO**

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2010p-001570 08/21/2012 - 05/21/2013

Are you currently doing shift work, that is, working early morning, evening, or night shifts?...YES NO

Do you ever have trouble falling asleep? .....YES NO
If yes, how often? _____ times per WEEK MONTH YEAR (circle one)
If yes, did this get start or get worse since your concussion? **YES NO**

Do you ever have trouble staying asleep? .....YES NO
If yes, how often? _____ times per WEEK MONTH YEAR (circle one)
If yes, did this start or get worse since your concussion? **YES NO**

Do you take more than two daytime naps per month? ..... **YES NO**
If yes, about how many times per week do you nap? ..... _____
At what time of day do you normally take your nap? ____:____ AM/PM to ____:____AM/PM
Do you consider yourself a light, normal, or heavy sleeper? .....**LIGHT NORMAL HEAVY**
Have you been told or do you think that you snore excessively? **YES NO**
Have you ever been diagnosed or treated for sleep apnea or sleep disordered breathing? **YES NO**

I yawn often
Never **1 2 3 4 5 6 7 8 9 10** Always yawning

When I see or hear someone else yawn, I will yawn too
Never **1 2 3 4 5 6 7 8 9 10** Every time

RECENT RISK OF DOZING OFF (ESS)

How likely are to doze off or fall asleep in the following situations, in contrast to feeling just tired? This refers to your **usual way of life in recent times**. Even if you have not done some of these things recently try to work out how they would have affected you. Use the following scale to choose the most appropriate number for each situation:

0 = would never doze
1 = slight chance of dozing
2 = moderate chance of dozing
3 = high chance of dozing

SITUATION	CHANCE OF DOZING (0-3)			
Sitting and reading	0	1	2	3
Watching TV	0	1	2	3
Sitting, inactive in a public place (e.g. a theatre or meeting)	0	1	2	3
As a passenger in a car for an hour without a break	0	1	2	3
Lying down to rest in the afternoon when circumstances permit	0	1	2	3
Sitting and talking to someone	0	1	2	3
Sitting quietly after a lunch without alcohol	0	1	2	3
In a car, while stopped for a few minutes in the traffic	0	1	2	3

Second Day of Scan Information Questionnaire

Subject #: _____ Date: _____

CAFFEINE USE

Did you have any caffeine containing products today? If so, how much? _____
On average, how many cups of caffeinated coffee do you drink per day? _____
On average, how many cups of caffeinated tea do you drink per day? _____
On average, how many cans of caffeinated soda do you drink per day? _____
On average, how many caffeinated sports drinks do you drink per day? _____(brand)
Do you use any other caffeinated products, such as Vivarin? **YES NO**
If YES, **WHAT**? _____ How much?_____ How often? _____

NICOTINE USE

Do you smoke cigarettes? **YES NO**
- If **YES**, about how many cigarettes do you smoke per day? _____
  - How long have you been smoking? _____ **years** _____ **months**
  - Have you tried to quit? **YES NO**
    - If **YES**, how many times? _____
- If **NO**, did you ever smoke cigarettes in the past? **YES NO**
  - If **YES**, how many cigarettes did you smoke per day? _____
  - When did you start smoking? _____ (date)
  - When did you quit? _____ (date)

Do you use smokeless tobacco, such as dip or chew? **YES NO**
- If **YES**, about how much do you use per day? _____
- If **NO**, did you ever use smokeless tobacco in the past? **YES NO**
  - If **YES**, how much did you use per day? _____
  - When did you start using? _____ (year)
  - When did you quit? _____ (year)

Do you use any other nicotine-containing products? **YES NO**
- If YES, **WHAT**? _____ How much?_____ How often? _____

OTHER

Do you take diet pills? **YES NO**
- If **YES**, what brand? _____ How much?_____ How often?

Are you currently taking any medications, vitamins, or supplements? **YES NO**
- If **YES**, please list:
  - Name: _____ Dosage: _____
  - Name: _____ Dosage: _____
  - Name: _____ Dosage: _____
  - Name: _____ Dosage: _____

How many times per month do you drink (alcohol)? _____
- On those occasions, what is the average number of drinks you consume? _____
- On those occasions, what is the largest number of drinks you consume? _____

How many times in the past year have you used marijuana? _____
Have you ever used marijuana at other times in your life? **YES NO**
- If **YES**, at what age did you begin smoking marijuana? _____
- On approximately how many occasions have you used marijuana? _____

Do you use any other street drugs currently or in the past year? **YES NO**
If YES, **WHAT**? _____ How much?_____ How often? _____

PHYSICAL INFORMATION

If female, when was the start of your last menstrual period (be as precise as possible)?
Date of period:_____ or about _____days ago.

CURRENT SLEEP HABITS

How much sleep did you get last night? _____

In the past two weeks, how much do you typically sleep on weeknights (Sun-Thur)? _____

In the past two weeks, how much do you typically sleep on weekend nights (Fri-Sat)?_____

In the past two weeks, at what time do you normally go to bed at night on:
week nights (Sun-Thur)? _____ AM PM (midnight = 12 AM; noon = 12 PM)
weekends (Fri-Sat)? _____ AM PM

In the past two weeks, what time do you typically awaken on:
weekdays (Mon-Fri)? _____ AM PM
weekends (Sat-Sun)? _____ AM PM

In the past two weeks, how long does it typically take you to fall asleep at night?
on week nights (Sun-Thur)? _____ MIN HRS
on weekends (Fri-Sat)? _____ MIN HRS

In the past two weeks, at what time of day do you feel sleepiest? _____ AM PM
At what time of day do you feel most alert? _____ AM PM

In the past two weeks, how many hours do you need to sleep to feel your best? _____

"In the past two weeks…"
"If I get less than _____ hours of sleep, I notice an impairment in my ability to function at work."
"If I get more than _____ hours of sleep, I notice an impairment in my ability to function at work."
In the past two weeks:

Is daytime sleepiness currently a problem for you? .....**YES NO**

Are you currently doing shift work, that is, working early morning, evening, or night shifts?...YES NO

Do you ever have trouble falling asleep? .....YES NO
If yes, how often? _____ times per WEEK MONTH YEAR (circle one)

Do you ever have trouble staying asleep? .....YES NO
If yes, how often? _____ times per WEEK MONTH YEAR (circle one)

Do you take more than two daytime naps per month? ..... **YES NO**
If yes, about how many times per week do you nap? ..... _____
At what time of day do you normally take your nap? ____:____ AM/PM to ____:____AM/PM
Do you consider yourself a light, normal, or heavy sleeper? .....**LIGHT NORMAL HEAVY**
Have you been told or do you think that you snore excessively? **YES NO**
Have you ever been diagnosed or treated for sleep apnea or sleep disordered breathing? **YES NO**

I yawn often
Never **1 2 3 4 5 6 7 8 9 10** Always yawning

When I see or hear someone else yawn, I will yawn too
Never **1 2 3 4 5 6 7 8 9 10** Every time

RECENT RISK OF DOZING OFF (ESS)

How likely are to doze off or fall asleep in the following situations, in contrast to feeling just tired? This refers to your **usual way of life in the last two weeks**. Even if you have not done some of these things recently try to work out how they would have affected you. Use the following scale to choose the most appropriate number for each situation:

0 = would never doze
1 = slight chance of dozing
2 = moderate chance of dozing
3 = high chance of dozing

SITUATION	CHANCE OF DOZING (0-3)			
Sitting and reading	0	1	2	3
Watching TV	0	1	2	3
Sitting, inactive in a public place (e.g. a theatre or meeting)	0	1	2	3
As a passenger in a car for an hour without a break	0	1	2	3
Lying down to rest in the afternoon when circumstances permit	0	1	2	3
Sitting and talking to someone	0	1	2	3
Sitting quietly after a lunch without alcohol	0	1	2	3
In a car, while stopped for a few minutes in the traffic	0	1	2	3

MEQ

SUBJECT:_____ DATE: _____/_____/_____

1. Considering only your own "feeling best" rhythm, at what time would you get up if you were entirely free to plan your day?
   - _____5:00 - 6:30 AM
   - _____6:30 - 7:45 AM
   - _____7:45 - 9:45 AM
   - _____9:45 - 11:00 AM
   - _____11:00 AM - 12:00 PM

2. Considering only your own "feeling best" rhythm, at what time would you go to bed if you were entirely free to plan your evening?
   - _____8:00 - 9:00 PM
   - _____9:00 - 10:15 PM
   - _____10:15 PM - 12:30 AM
   - _____12:30 - 1:45 AM
   - _____1:45 - 3:00 AM

3. If there is a specific time at which you have to get up in the morning, to what extent are you dependent on being woken up by an alarm clock?
   - _____not at all dependent
   - _____slightly dependent
   - _____fairly dependent
   - _____very dependent

4. Assuming adequate environmental conditions, how easy do you find getting up in the mornings?
   - _____not at all easy
   - _____not very easy
   - _____fairly easy
   - _____very easy

5. How alert do you feel during the first half hour after having woken in the mornings?
   - _____not at all alert
   - _____slightly alert
   - _____fairly alert
   - _____very alert

6. How is your appetite during the first half-hour after having woken in the mornings?
   - _____very poor
   - _____fairly poor
   - _____fairly good
   - _____very good

7. During the first half-hour after having woken in the morning, how tired do you feel?
   - _____very tired
   - _____fairly tired
   - _____fairly refreshed
   - _____very refreshed

8. When you have no commitments the next day, at what time do you go to bed compared to your usual bedtime?

_____seldom or never later
_____less than one hour later
_____1-2 hours later
_____more than two hours later

9. You have decided to engage in some physical exercise. A friend suggests that you do this one hour twice a week and the best time for him is between 7:00-8:00 AM. Bearing in mind nothing else but your own "feeling best" rhythm how do you think you would perform?
____would be in good form
_____would be in reasonable for
_____would find it difficult
_____would find it very difficult

10. At what time in the evening do you feel tired and as a result in need of sleep?
_____8:00 - 9:00 PM
_____9:00 - 10:15 PM
____10:15 PM - 12:45 AM
____12:45 - 2:00 AM
____2:00 - 3:00 AM

11. You wish to be at your peak performance for a test which you know is going to be mentally exhausting and lasting for two hours. You are entirely free to plan your day and considering only your own "feeling best" rhythm which ONE of the four testing times would you choose?
_____8:00 - 10:00 AM
_____11:00 AM - 1:00 PM
_____3:00 - 5:00 PM
_____7:00 - 9:00 PM

12. If you went to bed at 11:00 PM at what level of tiredness would you be?
_____not at all tired
_____a little tired
_____fairly tired
_____very tired

13. For some reason you have gone to bed several hours later than usual, but there is no need to get up at any particular time the next morning. Which ONE of the following events are you most likely to experience?
_____will wake up at usual time and will NOT fall asleep
_____will wake up at usual time and will doze thereafter
_____will wake up at usual time but will fall asleep again
_____will NOT wake up until later than usual

14. One night you have to remain awake between 4:00 - 6:00 AM in order to carry out a night watch. You have no commitments the next day. Which ONE of the following alternatives will suit you best?
_____would NOT go to bed until watch was over
_____would take a nap before and sleep after
_____would take a good sleep before and nap after
_____would take ALL sleep before watch

15. You have to do two hours of hard physical work. You are entirely free to plan your day and considering only your own "feeling best" rhythm which ONE of the following times would you choose?
    _____8:00 - 10:00 AM
    _____11:00 AM - 1:00 PM
    _____3:00 - 5:00 PM
    _____7:00 - 9:00 PM

16. You have decided to engage in hard physical exercise. A friend suggests that you do this for one hour twice a week and the best time for him is between 10:00 - 11:00 PM. Bearing in mind nothing else but your own "feeling best" rhythm how well do you think you would perform?
    _____would be in good form
    _____would be in reasonable form
    _____would find it difficult
    _____would find it very difficult

17. Suppose that you can choose your own work hours. Assume that you worked a FIVE-hour day (including breaks) and that your job was interesting and paid by results. During which time period would you want that five consecutive hours to END?
    _____12:00 - 4:00 AM
    _____4:00 - 8:00 AM
    _____8:00 - 9:00 AM
    _____9:00 AM - 2:00 PM
    _____2:00 - 5:00 PM
    _____5:00 PM - 12:00 AM

18. At what time of the day do you think that you reach your "feeling best" peak?
    _____12:00 - 5:00 AM
    _____5:00 - 8:00 AM
    _____8:00 - 10:00 AM
    _____10:00 AM - 5:00 PM
    _____5:00 - 10:00 PM
    _____10:00 PM - 12:00 AM

19. One hears about "morning" and "evening" types of people. Which ONE of these types do you consider yourself to be?
    _____definitely a "morning" person
    _____rather more a "morning" than an "evening" type
    _____rather more an "evening" than a "morning" type
    _____definitely an "evening" type

FOSQ

Study ID _____ Date_____

Some people have difficulty performing everyday activities when they feel tired or sleepy. The purpose of this questionnaire is to find out if you generally have difficulty carrying out certain activities because you are too sleepy or tired. In this questionnaire, when the words “sleepy” or “tired” are used, it means the feeling that you can’t keep your eyes open, your head is droopy, that you want to “nod off”, or that you feel the urge to take a nap. These words do not refer to the tired or fatigued feeling you may have after you have exercised.

Please circle one answer for each question. Please try to be as accurate as possible.

0 – I don’t do this activity for other reasons
1 – No difficulty
2 – Yes, a little difficulty
3 – Yes, Moderate difficulty
4 – Yes, Extreme difficulty

1. Do you generally have difficulty concentrating on things you do because you are sleepy or tired?	0	1	2	3	4
2. Do you generally have difficulty remembering things because you are sleepy or tired?	0	1	2	3	4
3. Do you have difficulty finishing a meal because you become sleepy or tired?	0	1	2	3	4
4. Do you have difficulty working on a hobby (for example: sewing, collecting, gardening) because you are sleepy or tired?	0	1	2	3	4
5. Do you have difficulty doing work around the house (for example: cleaning house, doing laundry, taking out the trash, repair work) because you are sleepy or tired?	0	1	2	3	4
6. Do you have difficulty operating a motor vehicle for short distances (less than 100 miles) because you become sleepy or tired?	0	1	2	3	4
7. Do you have difficulty operating a motor vehicle for long distances (greater than 100 miles) because you become sleepy or tired?	0	1	2	3	4
8. Do you have difficulty getting things done because you are too sleepy or tired to drive or take public transportation?	0	1	2	3	4
9. Do you have difficulty take care of financial affairs and doing paperwork (for example: writing checks, paying bills, keeping financial records, filling out tax forms, etc.) because you are sleepy or tired?	0	1	2	3	4
10. Do you have difficulty performing employed or volunteer work because you are sleepy or tired?	0	1	2	3	4
11. Do you have difficulty maintaining a telephone conversation because you become sleepy or tired?	0	1	2	3	4

0 – I don’t do this activity for other reasons

1 – No difficulty
2 – Yes, a little difficulty
3 – Yes, Moderate difficulty
4 – Yes, Extreme difficulty

12. Do you have difficulty visiting with your family or friends in **your** home because you become sleepy or tired?	0	1	2	3	4
13. Do you have difficulty visiting with your family or friends in **their** homes because you become sleepy or tired?	0	1	2	3	4
14. Do you have difficulty doing things for your family or friends because you become sleepy or tired?	0	1	2	3	4
15. Has your relationship with family, friends or work colleagues been affected because you are sleepy or tired?		1	2	3	4
16. Do you have difficulty exercising or participating in a sporting activity because you are too sleepy or tired?	0	1	2	3	4
17. Do you have difficulty watching a movie or videotape because you become sleepy or tired?	0	1	2	3	4
18. Do you have difficulty enjoying the theater or a lecture because you become sleepy or tired?	0	1	2	3	4
19. Do you have difficulty enjoying a concert because you become sleepy or tired?	0	1	2	3	4
20. Do you have difficulty watching television because you are sleepy or tired?	0	1	2	3	4
21. Do you have difficulty participating in religious services, meetings or a group club because you are sleepy or tired?	0	1	2	3	4
22. Do you have difficulty being as active as you want to be in the evening because you are sleepy or tired?	0	1	2	3	4
23. Do you have difficulty being as active as you want to be in the morning because you are sleepy or tired?	0	1	2	3	4
24. Do you have difficulty being as active as you want to be in the afternoon because you are sleepy or tired?	0	1	2	3	4
25. Do you have difficulty keeping a pace with others your own age because you are sleepy or tired?	0	1	2	3	4
26. How would you rate yourself in your general level of activity?		1	2	3	4
		1= Very low; 2= Low; 3= Medium; 4= High			
27. Has your intimate or sexual relationship been affected because you are sleepy or tired?	0	1	2	3	4
28. Has your desire for intimacy or sex been affected because you are sleepy or tired?	0	1	2	3	4
29. Has your ability to become sexually aroused been affected because you are sleepy or tired?	0	1	2	3	4
30. Has your ability to have an orgasm been affected because you are sleepy or tired?	0	1	2	3	4

VIII. Preferences

1. Please mark the bubble which best describes your feelings **RIGHT NOW**.

I feel like gambling

not at all ○○○○○○○○○○○○○○○○○○○○○○○○○ very much

I am driving and the light turns yellow. I feel like

stopping ○○○○○○○○○○○○○○○○○○○○○○○○○ accelerating

The lights suddenly go out in an unfamiliar stairwell

I don't move ○○○○○○○○○○○○○○○○○○○○○○○○○ I proceed immediately

I feel like

avoiding everyone ○○○○○○○○○○○○○○○○○○○○○○○○○ taking on the world

I feel like diving from a diving board, which is

very high ○○○○○○○○○○○○○○○○○○○○○○○○○ very low

I like

routine ○○○○○○○○○○○○○○○○○○○○○○○○○ adventure

I seek

the thrill of danger ○○○○○○○○○○○○○○○○○○○○○○○○○ tranquillity

I am in a hurry

I take a dangerous shortcut ○○○○○○○○○○○○○○○○○○○○○○○○○ I take a safe detour

I am open to

negotiation ○○○○○○○○○○○○○○○○○○○○○○○○○ confrontation

I prefer to

direct ○○○○○○○○○○○○○○○○○○○○○○○○○ be supervised

I give priority to

reason ○○○○○○○○○○○○○○○○○○○○○○○○○ action

I like to listen to music

at a loud volume ○○○○○○○○○○○○○○○○○○○○○○○○○ very softly

I am sure of myself

not at all ○○○○○○○○○○○○○○○○○○○○○○○○○ completely

I prefer discussions, which are

animated ○○○○○○○○○○○○○○○○○○○○○○○○○ calm

A hostile situation

weakens me ○○○○○○○○○○○○○○○○○○○○○○○○○ reinforces me

A menacing dog approaches

I confront it ○○○○○○○○○○○○○○○○○○○○○○○○○ I run away

Faced with a potentially dangerous event

I take my time ○○○○○○○○○○○○○○○○○○○○○○○○○ I instantly react

Seeing a person who is drowning, I first

dive in ○○○○○○○○○○○○○○○○○○○○○○○○○ call for help

I prefer work that is

well planned ○○○○○○○○○○○○○○○○○○○○○○○○○ not planned

I am right

all the time ○○○○○○○○○○○○○○○○○○○○○○○○○ never

I emphasize

precision ○○○○○○○○○○○○○○○○○○○○○○○○○ speed

I like to drive

very fast ○○○○○○○○○○○○○○○○○○○○○○○○○ very slow

I like to listen to music with a tempo that is

very slow ○○○○○○○○○○○○○○○○○○○○○○○○○ very fast

I like to take risks

not at all ○○○○○○○○○○○○○○○○○○○○○○○○○ a lot

THANK YOU FOR COMPLETING THIS SURVEY!

Please provide any additional comments below or on the back of the survey, if needed.

PATIENT HEALTH QUESTIONNAIRE (PHQ-9)

NAME:_____ DATE:_____

Over the last *2 weeks,* how often have you been bothered by any of the following problems?
(use "✓" to indicate your answer)

	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself—or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed. Or the opposite – being so figety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead, or of hurting yourself	0	1	2	3
add columns		+	+	

(Healthcare professional: For interpretation of TOTAL, please refer to accompanying scoring card). TOTAL:

10. If you checked off *any problems,* how *difficult* have these problems made it for you to do your work, take care of things at home, or get along with other people?

- Not difficult at all _____
- Somewhat difficult _____
- Very difficult _____
- Extremely difficult _____

A2663B 10-04-2005

Session (1 or 2)_____ID#_____Date_____Time_____AM PM

PITTSBURGH SLEEP QUALITY INDEX

INSTRUCTIONS:
The following questions relate to your usual sleep habits during the past month only. Your answers should indicate the most accurate reply for the majority of days and nights in the past month. Please answer all questions.

1. During the past month, what time have you usually gone to bed at night?

   BED TIME _____

2. During the past month, how long (in minutes) has it usually taken you to fall asleep each night?

   NUMBER OF MINUTES _____

3. During the past month, what time have you usually gotten up in the morning?

   GETTING UP TIME _____

4. During the past month, how many hours of actual sleep did you get at night? (This may be different than the number of hours you spent in bed.)

   HOURS OF SLEEP PER NIGHT _____

For each of the remaining questions, check the one best response. Please answer all questions.

5. During the past month, how often have you had trouble sleeping because you . . .

a) Cannot get to sleep within 30 minutes

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

b) Wake up in the middle of the night or early morning

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

c) Have to get up to use the bathroom

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

d) Cannot breathe comfortably

Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____

e) Cough or snore loudly

Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____

f) Feel too cold

Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____

g) Feel too hot

Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____

h) Had bad dreams

Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____

i) Have pain

Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____

j) Other reason(s), please describe_____

_____

How often during the past month have you had trouble sleeping because of this?

Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____

6. During the past month, how would you rate your sleep quality overall?

Very good _____

Fairly good _____

Fairly bad _____

Very bad _____

7. During the past month, how often have you taken medicine to help you sleep (prescribed or "over the counter")?

Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____

8. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?

Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____

9. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?

No problem at all _____

Only a very slight problem _____

Somewhat of a problem _____

A very big problem _____

10. Do you have a bed partner or room mate?

No bed partner or room mate _____

Partner/room mate in other room _____

Partner in same room, but not same bed _____

Partner in same bed _____

If you have a room mate or bed partner, ask him/her how often in the past month you have had . . .

a) Loud snoring

Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____

b) Long pauses between breaths while asleep

Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____

c) Legs twitching or jerking while you sleep

Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____

d) Episodes of disorientation or confusion during sleep

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

e) Other restlessness while you sleep; please describe_____

_____

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

Buysse DJ, Reynolds CF, Monk TH, Berman SR, Kupfer DJ: Psychiatry Research, 28:193-213, 1989.

Rivermead Post Concussion Symptoms Questionnaire

Modified (Rpq-3 And Rpq-13)[42] Printed With Permission: Modified Scoring System From Eyres 2005 [28]

Name: Date:

After a head injury or accident some people experience symptoms that can cause worry or nuisance. We would like to know if you now suffer any of the symptoms given below. Because many of these symptoms occur normally, we would like you to compare yourself now with before the accident. For each symptom listed below please circle the number that most closely represents your answer.

0 = not experienced at all
1 = no more of a problem
2 = a mild problem
3 = a moderate problem
4 = a severe problem

Compared with **before** the accident, do you **now** (i.e., over the last 24 hours) suffer from:

	not experienced	no more of a problem	mild problem	moderate problem	severe problem
Headaches	0	1	2	3	4
Feelings of dizziness	0	1	2	3	4
Nausea and/or vomiting	0	1	2	3	4
Noise sensitivity (easily upset by loud noise)	0	1	2	3	4
Sleep disturbance	0	1	2	3	4
Fatigue, tiring more easily	0	1	2	3	4
Being irritable, easily angered	0	1	2	3	4
Feeling depressed or tearful	0	1	2	3	4
Feeling frustrated or impatient	0	1	2	3	4
Forgetfulness, poor memory	0	1	2	3	4
Poor concentration	0	1	2	3	4
Taking longer to think	0	1	2	3	4
Blurred vision	0	1	2	3	4
Light sensitivity (easily upset by bright light)	0	1	2	3	4
Double vision	0	1	2	3	4
Restlessness	0	1	2	3	4
Are you experiencing any other difficulties? Please specify, and rate as above.					
1.	0	1	2	3	4
2.	0	1	2	3	4

Administration only:

RPQ-3 *(total for first three items)*	
RPQ-13 *(total for next 13 items)*	

http://www.maa.nsw.gov.au/default.aspx?MenuID=148

Rivermead Post Concussion Symptoms Questionnaire (cont.)

Modified (Rpq-3 And Rpq-13)[42] Printed With Permission: Modified Scoring System From Eyres 2005 [28]

Administration only

Individual item scores reflect the presence and severity of post concussive symptoms. Post concussive symptoms, as measured by the RPQ, may arise for different reasons subsequent to (although not necessarily directly because of) a traumatic brain injury. The symptoms overlap with broader conditions, such as pain, fatigue and mental health conditions such as depression[72].

The questionnaire can be repeated to monitor a patient's progress over time. There may be changes in the severity of symptoms, or the range of symptoms. Typical recovery is reflected in a reduction of symptoms and their severity within three months.

Scoring

The scoring system has been modified from Eyres, 2005[24].

The items are scored in two groups. The first group (RPQ-3) consists of the first three items (headaches, feelings of dizziness and nausea) and the second group (RPQ-13) comprises the next 13 items. The total score for RPQ-3 items is potentially 0–12 and is associated with early symptom clusters of post concussive symptoms. If there is a higher score on the RPQ-3, earlier reassessment and closer monitoring is recommended.

The RPQ-13 score is potentially 0–52, where higher scores reflect greater severity of post concussive symptoms. The RPQ-13 items are associated with a later cluster of symptoms, although the RPQ-3 symptoms of headaches, dizziness and nausea may also be present. The later cluster of symptoms is associated with having a greater impact on participation, psychosocial functioning and lifestyle. Symptoms are likely to resolve within three months. A gradual resumption of usual activities is recommended during this period, appropriate to symptoms. If the symptoms do not resolve within three months, consideration of referral for specialist assessment or treatment services is recommended.

References:

Eyres, S., Carey, A., Gilworth, G., Neumann, V., Tennant, A. (2005). Construct validity and reliability of the Rivermead Post Concussion Symptoms Questionnaire. *Clinical Rehabilitation*, 19, 878-887.

King, N. S., Crawford, S., Wenden, F.J., Moss, N.E.G. Wade, D.T. (1995). The Rivermead Post Concussion Symptoms Questionnaire: a measure of symptoms commonly experienced after head injury and its reliability *Journal of Neurology*, 242, 587-592.

Potter, S., Leigh, E., Wade, D., Fleminger, S. (2006). The Rivermead Post Concussion Symptoms Questionnaire *Journal of Neurology*, October 1-12.

BDI

SUBJECT ID#:_____ DATE: _____/_____/_____

INSTRUCTIONS: On this questionnaire are groups of statements. Please read each group of statements carefully. Then pick out the one statement in each group which best describes the way you have been feeling in the **PAST WEEK, INCLUDING TODAY!** Circle the number beside the statement you picked. If several statements in the group seem to apply equally well, circle each one. **Be sure to read all the statements in each group before making your choice.**

1.	0	I do not feel sad.
	1	I feel sad.
	2	I am sad all the time and I can't snap out of it.
	3	I am so sad or unhappy that I can't stand it.
2.	0	I am not particularly discouraged about the future.
	1	I feel discouraged about the future.
	2	I feel I have nothing to look forward to.
	3	I feel that the future is hopeless and that things cannot improve.
3.	0	I do not feel like a failure.
	1	I feel I have failed more than the average person.
	2	As I look back on my life, all I can see is a lot of failures.
	3	I feel I am a complete failure as a person.
4.	0	I get as much satisfaction out of things as I used to.
	1	I don't enjoy things the way I used to.
	2	I don't get real satisfaction out of anything anymore.
	3	I am dissatisfied or bored with everything.
5.	0	I don't feel particularly guilty.
	1	I feel guilty a good part of the time.
	2	I feel quite guilty most of the time.
	3	I feel guilty all of the time.
6.	0	I don't feel I am being punished.
	1	I feel I may be punished.
	2	I expect to be punished.
	3	I feel I am being punished.
7.	0	I don't feel disappointed in myself.
	1	I am disappointed in myself.
	2	I am disgusted with myself.
	3	I hate myself.
8.	0	I don't feel I am any worse than anybody else.
	1	I am critical of myself for my weaknesses or mistakes.
	2	I blame myself all the time for my faults.
	3	I blame myself for everything bad that happens.
9.	0	I don't have any thoughts of killing myself.
	1	I have thoughts of killing myself, but I would not carry them out.
	2	I would like to kill myself.
	3	I would kill myself if I had the chance.

10. 0 I don't cry any more than usual.
1 I cry more now than I used to.
2 I cry all the time now.
3 I used to be able to cry, but now I can't cry even though I want to.

11 0 I am no more irritated now than I ever am.
1 I get annoyed or irritated more easily than I used to.
2 I feel irritated all the time now.
3 I don't get irritated at all by the things that used to irritate me.

12. 0 I have not lost interest in other people.
1 I am less interested in other people than I used to be.
2 I have lost most of my interest in other people.
3 I have lost all of my interest in other people.

13. 0 I make decisions about as well as ever.
1 I put off making decisions more than I used to.
2 I have greater difficulty in making decisions than before.
3 I can't make any decisions at all anymore.

14. 0 I don't feel I look any worse than I used to.
1 I am worried that I am looking old or unattractive.
2 I feel that there are permanent changes in my appearance that make me look unattractive.
3 I believe that I look ugly.

15. 0 I can work about as well as before.
1 It takes extra effort to get started at doing something.
2 I have to push myself very hard to do anything.
3 I can't do any work at all.

16. 0 I can sleep as well as usual.
1 I don't sleep as well as I used to.
2 I wake up 1-2 hours earlier than usual and find it hard to get back to sleep.
3 I wake up several hours earlier than I used to and cannot get back to sleep.

17. 0 I don't get more tired than usual.
1 I get tired more easily than I used to.
2 I get tired from doing almost anything.
3 I am too tired to do anything.

18. 0 My appetite is no worse than usual.
1 My appetite is not as good as it used to be.
2 My appetite is much worse now.
3 I have no appetite at all anymore.

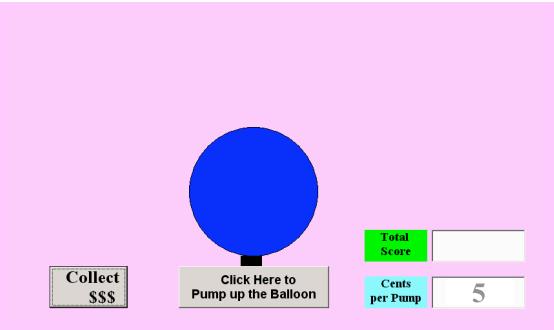
19. 0 I haven't lost much weight, if any, lately.
1 I have lost more than 5 pounds.
2 I have lost more than 10 pounds.
3 I have lost more than 15 pounds.
I am purposely trying to lose weight by eating less YES ____ NO ____

20. 0 I am no more worried about my health than usual.
1 I am worried about physical problems such as aches and pains, or upset stomach, or constipation.
2 I am very worried about physical problems and it's hard to think of much else.
3 I am so worried about my physical problems that I cannot think about anything else.

21. 0 I have not noticed any recent change in my interest in sex.
1 I am less interested in sex than I used to be.
2 I am much less interested in sex now.
3 I have lost interest in sex completely.

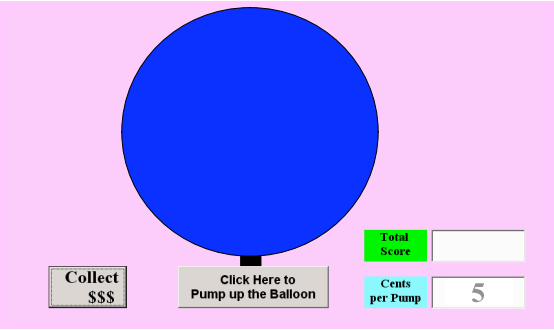
Balloon Analog Risk Task

Inflate Balloon by Pressing Key



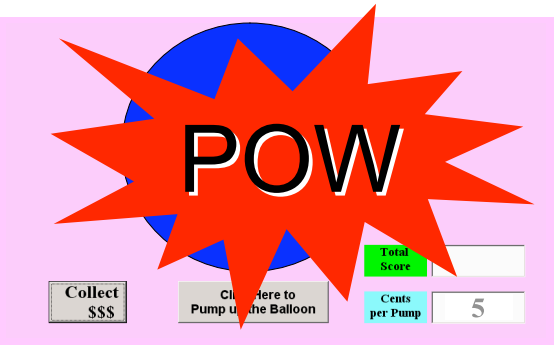
- The BART presents participants with 30 virtual balloons.
- Each balloon can be inflated one increment for each key press.

Balloon Grows in Size and $$$ Value



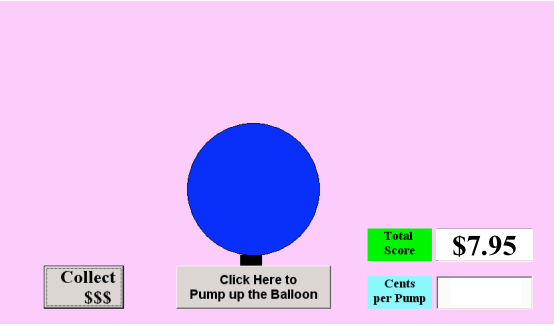
- With each key press the size of the balloon increases.
- Each increment also increases the potential value of the balloon by 5 cents.
- The balloon can be "cashed in" at any time and the total accumulated value retained.

If Balloon Explodes, All $$$ is Lost



- Each balloon can explode at any time.
- If a balloon explodes, all of the potential money accumulated *for that balloon* will be lost.

Goal: Earn as Much Money as Possible



- The goal is to maximize winnings.
- Only 30 balloons are presented

STAI Form S

Name:_____ Date:_____

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you feel right now, THAT IS, at this moment.

There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

	Not at all	Somewhat	Moderately so	Very much so
1. I feel calm	1	2	3	4
2. I feel secure	1	2	3	4
3. I am tense	1	2	3	4
4. I feel regretful	1	2	3	4
5. I feel at ease	1	2	3	4
6. I feel upset	1	2	3	4
7. I am presently worrying over possible misfortunes	1	2	3	4
8. I feel rested	1	2	3	4
9. I feel anxious	1	2	3	4
10. I feel comfortable	1	2	3	4
11. I feel self-confident	1	2	3	4
12. I feel nervous	1	2	3	4
13. I am jittery	1	2	3	4
14. I feel "high strung"	1	2	3	4
15. I am relaxed	1	2	3	4
16. I feel content	1	2	3	4
17. I am worried	1	2	3	4
18. I feel over-excited and "rattled"	1	2	3	4
19. I feel joyful	1	2	3	4
20. I feel pleasant	1	2	3	4

STAI Form T

NAME_____ DATE_____

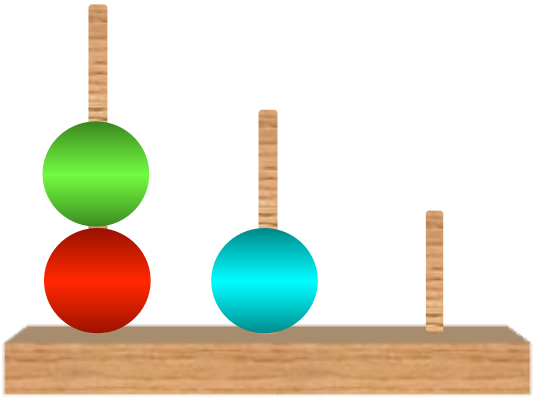
DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you generally feel.

There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

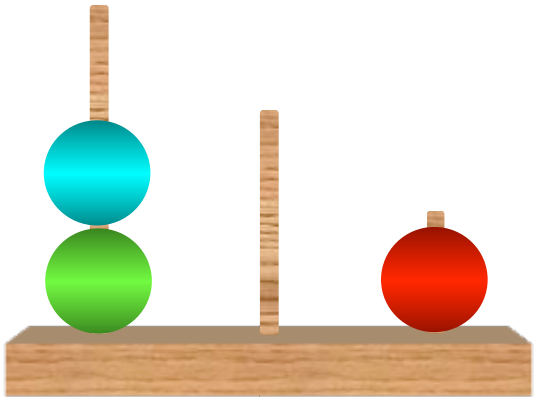
	Almost never	Sometimes	Often	Almost always
21. I feel pleasant	1	2	3	4
22. I tire quickly	1	2	3	4
23. I feel like crying	1	2	3	4
24. I wish I could be as happy as others seem to be	1	2	3	4
25. I am losing out on things because I can't make up my mind soon enough	1	2	3	4
26. I feel rested	1	2	3	4
27. I am "calm, cool, and collected"	1	2	3	4
28. I feel that difficulties are piling up so that I cannot overcome them	1	2	3	4
29. I worry too much over something that really doesn't matter	1	2	3	4
30. I am happy	1	2	3	4
31. I am inclined to take things hard	1	2	3	4
32. I lack self-confidence	1	2	3	4
33. I feel secure	1	2	3	4
34. I try to avoid facing a crises or difficulty	1	2	3	4
35. I feel blue	1	2	3	4
36. I am content	1	2	3	4
37. Some unimportant thought runs through my mind and bothers me	1	2	3	4
38. I take disappointments so keenly that I can't put them out of my mind	1	2	3	4
39. I am a steady person	1	2	3	4
40. I get in a state of tension or turmoil as I think over my recent concerns and interests	1	2	3	4

Tower of London Task

Your Tower



Goal



Daily Sleep Diary

Use this sleep diary **every day** to help you track the quantity and quality of your sleep. Reflecting on the previous day, please fill out this diary during your exposure to the lightbox. If you have any questions or concerns, please call **(617)-** 855-2239.

Date: **Light box start time:**

Bed time last night _____:_____ ☐AM ☐PM
Wake time this morning ______:______ ☐AM ☐PM
It took me _______ (hr) ______ (min) to fall asleep
I woke up ________ times during the night
I took a nap from _____:____ to _____:______. ☐**N/A**
Number of caffeinated beverages: ________

I woke up this morning feeling
☐ refreshed
☐ somewhat refreshed
☐ fatigued
I consumed caffeine yesterday:
☐ morning ☐ afternoon ☐ evening

Most of the day yesterday, I felt:
Very sleepy 1 2 3 4 5 6 7 Very alert

Yesterday my mood was:
Very poor 1 2 3 4 5 6 7 Very good

Yesterday I had problems with headache pain:
Not at all 1 2 3 4 5 6 7 Very severe

Yesterday I ate more than I intended to:
Disagree 1 2 3 4 5 6 7 Agree

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Curriculum Vitae

Date Prepared: **January 20, 2015**

Name: WILLIAM DALE (SCOTT) KILLGORE

Office Address: Suite 7303B
Department of Psychiatry
University of Arizona HSC
1501 North Campbell Ave.
PO Box 245002
Tucson, AZ 85724 United States

Home Address:

Work Phone:

Work Email: killgore@mclean.harvard.edu

Killgore@psychiatry.arizona.edu

Work FAX:

Place of Birth:

Education

1985	A.A. (Liberal Arts), San Antonio College
1985	A.A.S (Radio-TV-Film), San Antonio College
1990	B.A. (Psychology), Summa cum laude with Distinction, University of New Mexico
1992	M.A. (Clinical Psychology), Texas Tech University
1996	PH.D. (Clinical Psychology), Texas Tech University

Postdoctoral Training

08/95-07/96	Predoctoral Fellow, Clinical Psychology, Yale School of Medicine
08/96-07/97	Postdoctoral Fellow, Clinical Neuropsychology, University of OK Health Sciences Center
08/97-07/99	Postdoctoral Fellow, Clinical Neuropsychology, University of Pennsylvania Medical School
07/99-09/00	Research Fellow, Neuroimaging, McLean Hospital/ Harvard Medical School
09/13-05/14	Certificate in Applied Biostatistics, Harvard Medical School

Faculty Academic Appointments

10/00-08/02	Instructor in Psychology in the Department of Psychiatry Harvard Medical School, Boston, MA
09/02-07/07	Clinical Instructor in Psychology in the Department of Psychiatry Harvard Medical School, Boston, MA
08/07-10/10	Instructor in Psychology in the Department of Psychiatry

	Harvard Medical School, Boston, MA
04/08-	Faculty Affiliate, Division of Sleep Medicine Harvard Medical School, Boston, MA
10/10-10/12	Assistant Professor of Psychology in the Department of Psychiatry Harvard Medical School, Boston, MA
10/12-	Associate Professor of Psychology in the Department of Psychiatry Harvard Medical School

Appointments at Hospitals/Affiliated Institutions

10/00-08/02	Assistant Research Psychologist, McLean Hospital, Belmont, MA
08/02-07/04	Research Psychologist, Department of Behavioral Biology, Walter Reed Army Institute of Research, Silver Spring, MD
09/02-04/05	Special Volunteer, National Institute on Deafness and Other Communication Disorders (NIDCD), National Institutes of Health (NIH), Bethesda, MD
09/02-07/07	Consultant in Psychology, McLean Hospital, Belmont, MA
08/07-	Research Psychologist, McLean Hospital, Belmont, MA

Other Professional Positions

11/01-08/02	First Lieutenant, Medical Service Corps, United States Army Reserve (USAR)
08/02-07/05	Captain, Medical Service Corps, United States Army
08/05-10/07	Major, Medical Service Corps, United States Army
10/07-07/12	Major, Medical Service Corps, United States Army Reserve (USAR)
10/07-3/10	Chief Psychologist, GovSource, Inc., U.S. Department of Defense Government Contractor
08/08-	Consulting Psychologist, The Brain Institute, University of Utah
07/12-	Lieutenant Colonel, Medical Service Corps, United States Army Reserve (USAR)

Major Administrative Leadership Positions

Local

1988-1989	Undergraduate Teaching Assistant-Introduction to Psychology 102, University of New Mexico
1990-1991	Graduate Teaching Assistant-General Psychology 1300, Texas Tech University
1991-1992	Graduate Teaching Assistant-Psychology of Learning Laboratory 3317, Texas Tech University
2004-2007	Chief, Neurocognitive Performance Branch, Walter Reed Army Institute of Research, Silver Spring, MD
2005-2006	Neuropsychology Postdoctoral Program Training Supervisor, Walter Reed Hospital, Washington, DC
2011-	Co-Director, Social, Cognitive, and Affective Neuroscience Laboratory, McLean Hospital, Belmont, MA

Committee Service

Local

2003	Scientific Review Committee, Walter Reed Army Institute of Research (WRAIR), Silver Spring, MD
2005	Scientific Review Committee, Walter Reed Army Institute of Research (WRAIR), Silver Spring, MD
2012-	McLean Hospital Research Committee, McLean Hospital, Belmont, MA

Regional

2005-2006	Undergraduate Honors Thesis Committee, Jessica Richards [Chairperson], University of Maryland, Baltimore County
2011	Scientific Review Committee, U.S. Army Institute of Environmental Medicine (USARIEM), Natick, MA

National

2011-	National Network of Depression Centers, Military Task Group

International

2005-2006	Doctoral Thesis Committee, Belinda J. Liddell, University of Sydney, Australia

Professional Societies

1995-1997	American Psychological Association, Member
1998-2000	National Academy of Neuropsychology, Member
2012-	American Academy of Sleep Medicine, Member
2014-	Organization for Human Brain Mapping, Member

Grant Review Activities

National

2004	University of Alabama, Clinical Nutrition Research Center (UAB CNRC) Pilot/Feasibility Study Program Review Committee
2006	U.S. Small Business Administration, Small Business Technology Transfer (STTR) Program Review Committee
2006	Cognitive Performance Assessment Program Area Steering Committee, U.S. Army Military Operational Medicine Research Program Funding Panel
2007	Cognitive Performance Assessment Program Area Steering Committee, U.S. Army Military Operational Medicine Research Program Funding Panel
2008	United States Army Medical Research and Materiel Command (USAMRMC) Congressionally Directed Medical Research Programs (CDMRP) Extramural Grant Review Panel
2009	NIH-CSR Brain Disorders and Clinical Neuroscience N02 Member Study Conflict Section Review Panel
2009	Sleep Physiology and Fatigue Interventions Program Area Steering Committee, U.S. Army Military Operational Medicine Research Program
2011	National Science Foundation (NSF) Grant Reviewer
2012	National Science Foundation (NSF) Grant Reviewer

International

2009	Scotland, UK, Biomedical and Therapeutic Research Committee, Grant Reviewer
2010	Canada, Social Sciences and Humanities Research Council of Canada, Grant Reviewer
2011	Israel, Israel Science Foundation (ISF), Grant Reviewer
2013	Israel, Israel Science Foundation (ISF), Grant Reviewer

Editorial Activities

2001-2012	Reviewer, Psychological Reports
2001-2012	Reviewer, Perceptual and Motor Skills
2002	Reviewer, American Journal of Psychiatry
2002-2013	Reviewer, Biological Psychiatry
2003	Reviewer, Clinical Neurology and Neurosurgery
2004, 2013	Reviewer, NeuroImage
2004-2006	Reviewer, Neuropsychologia
2004	Reviewer, Journal of Neuroscience
2004	Reviewer, Consciousness and Cognition
2005	Reviewer, Experimental Brain Research
2005	Reviewer, Schizophrenia Research
2005-2012	Reviewer, Archives of General Psychiatry
2005	Reviewer, Behavioral Brain Research
2005-2009	Reviewer, Human Brain Mapping
2005-2013	Reviewer, Psychiatry Research: Neuroimaging
2006	Reviewer, Journal of Abnormal Psychology
2006	Reviewer, Psychopharmacology
2006	Reviewer, Developmental Science
2006	Reviewer, Acta Psychologica
2006	Reviewer, Neuroscience Letters
2006-2014	Reviewer, Journal of Sleep Research
2006-2013	Reviewer, Physiology and Behavior
2006-2014	Reviewer, SLEEP
2007	Reviewer, Journal of Clinical and Experimental Neuropsychology
2008	Reviewer, European Journal of Child and Adolescent Psychiatry
2008	Reviewer, Judgment and Decision Making
2008-2010	Reviewer, Aviation, Space, & Environmental Medicine
2008	Reviewer, Journal of Psychophysiology
2008	Reviewer, Brazilian Journal of Medical and Biological Research
2008	Reviewer, The Harvard Undergraduate Research Journal
2008	Reviewer, Bipolar Disorders
2008-2013	Reviewer, Chronobiology International
2008	Reviewer, International Journal of Obesity
2009	Reviewer, European Journal of Neuroscience
2009-2014	Reviewer, International Journal of Eating Disorders
2009	Reviewer, Psychophysiology
2009	Reviewer, Traumatology
2009	Reviewer, Clinical Medicine: Therapeutics
2009	Reviewer, Acta Pharmacologica Sinica
2009	Reviewer, Collegium Antropologicum

2009 Reviewer, Journal of Psychopharmacology
2009-2014 Reviewer, Obesity
2009 Reviewer, Scientific Research and Essays
2009 Reviewer, Child Development Perspectives
2009-2010 Reviewer, Personality and Individual Differences
2009-2010 Reviewer, Noise and Health
2009-2010 Reviewer, Sleep Medicine
2010 Reviewer, Nature and Science of Sleep
2010 Reviewer, Psychiatry and Clinical Neurosciences
2010 Reviewer, Learning and Individual Differences
2010 Reviewer, Cognitive, Affective, and Behavioral Neuroscience
2010 Reviewer, BMC Medical Research Methodology
2010-2011 Reviewer, Journal of Adolescence
2010-2012 Reviewer, Brain Research
2011 Reviewer, Brain
2011 Reviewer, Social Cognitive and Affective Neuroscience
2011 Reviewer, Journal of Traumatic Stress
2011 Reviewer, Social Neuroscience
2011-2014 Reviewer, Brain and Cognition
2011 Reviewer, Frontiers in Neuroscience
2011-2012 Reviewer, Sleep Medicine Reviews
2012 Reviewer, Journal of Experimental Psychology: General
2012 Reviewer, Ergonomics
2012 Reviewer, Behavioral Sleep Medicine
2012 Reviewer, Neuropsychology
2012 Reviewer, Emotion
2012 Reviewer, JAMA
2012 Reviewer, BMC Neuroscience
2012-2015 Reviewer, Cognition and Emotion
2012 Reviewer, Journal of Behavioral Decision Making
2012 Reviewer, Psychosomatic Medicine
2012-2014 Reviewer, PLoS One
2012 Reviewer, American Journal of Critical Care
2012-2014 Reviewer, Journal of Sleep Disorders: Treatment and Care
2013 Reviewer, Experimental Psychology
2013 Reviewer, Clinical Interventions in Aging
2013 Reviewer, Frontiers in Psychology
2013 Reviewer, Brain Structure and Function
2013 Reviewer, Appetite
2013 Reviewer, JAMA Psychiatry
2014 Reviewer, Acta Psychologica
2014 Reviewer, Neurology
2014 Reviewer, Applied Neuropsychology: Child
2014 Reviewer, Journal of Applied Psychology

Other Editorial Roles

2009- Editorial Board Member International Journal of Eating Disorders

2012-	Editor	Dataset Papers in Neuroscience
2012-	Editor	Dataset Papers in Medicine
2012-	Editor	Journal of Sleep Disorders: Treatment and Care

Honors and Prizes

1990	Outstanding Senior Honors Thesis in Psychology, University of New Mexico
1990-1995	Maxey Scholarship in Psychology, Texas Tech University
2001	Rennick Research Award, Co-Author, International Neuropsychological Society
2002	Honor Graduate, AMEDD Officer Basic Course, U.S. Army Medical Department Center and School
2002	Lynch Leadership Award Nominee, AMEDD Officer Basic Course, U.S. Army Medical Department Center and School
2003	Outstanding Research Presentation Award, 2003 Force Health Protection Conference, U.S. Army Center for Health Promotion and Preventive Medicine
2005	Edward L. Buescher Award for Excellence in Research by a Young Scientist, Walter Reed Army Institute of Research (WRAIR) Association
2009	Merit Poster Award, International Neuropsychological Society
2009	Outstanding Research Presentation Award, 2009 Force Health Protection Conference, U.S. Army Center for Health Promotion and Preventive Medicine
2010	Best Paper Award, Neuroscience, 27th U.S. Army Science Conference
2011	Published paper included in *Best of Sleep Medicine 2011*
2011	Blue Ribbon Finalist, 2011 Top Poster Award in Clinical and Translational Research, Society of Biological Psychiatry
2012	Defense Advance Research Projects Agency (DARPA) Young Faculty Award in Neuroscience
2014	Blue Ribbon Finalist, 2014 Top Poster Award in Basic Neuroscience, Society of Biological Psychiatry
2014	Harvard Medical School Excellence in Mentoring Award Nominee
2014	AASM Young Investigator Award (co-author), Honorable Mention, American Academy of Sleep Medicine

Report of Funded and Unfunded Projects

Funding Information

Past

2001-2003	fMRI of Unconscious Affect Processing in Adolescence. N.I.H., 1R03HD41542-01 P.I.: Killgore ($79,000.)
2003-2006	The Effects of Sleep-Loss and Stimulant Countermeasures on Judgment and Decision Making. U.S. Army Medical Research and Materiel Command (USAMRMC) Competitive Medical Research Proposal Program (CMRP), P.I.: Killgore (Total Award: $1,345,000.)

2004-2005 Sleep/wake Schedules in 3ID Aviation Brigade Soldiers.
Defense Advanced Research Projects Agency (DARPA)
P.I.: Killgore (Total Award: $60,000.)

2005-2006 Functional Neuroimaging Studies of Neural Processing Changes with Sleep and Sleep Deprivation.
U.S. Army Medical Research and Materiel Command (USAMRMC)
Task Area C (Warfighter Judgment and Decision Making) Program Funding
P.I.: Killgore (Total Award: $219,400.)

2006-2007 Establishing Normative Data Sets for a Series of Tasks to Measure the Cognitive Effects of Operationally Relevant Stressors.
U.S. Army Medical Research and Materiel Command (USAMRMC)
Task Area C (Warfighter Judgment and Decision Making) Program Funding,
P.I.: Killgore (Total Award: $154,000.)

2006-2007 Military Operational Medicine Research Program (MOM-RP), Development of the Sleep History and Readiness Predictor (SHARP).
U.S. Army Medical Research and Materiel Command (USAMRMC)
P.I.: Killgore (Total Award:$291,000.)

Current

2009-2014 The Neurobiological Basis and Potential Modification of Emotional Intelligence through Affective Behavioral Training.
U.S. Army Medical Research and Materiel Command (USAMRMC),
P.I.: Killgore (Total Award: $551,961.)
Major Goal: To identify the neurobiological basis of cognitive and emotional intelligence using functional and structural magnetic resonance imaging.

2011-2014 Effects of Bright Light Therapy on Sleep, Cognition, and Brain Function following Mild Traumatic Brain Injury.
U.S. Army Medical Research and Materiel Command (USAMRMC),
P.I.: Killgore (Total Award: $941,924)
Major Goal: To evaluate the effectiveness of morning exposure to bright light as a treatment for improving in sleep patterns among individuals with post-concussive syndrome. Effects of improved sleep on recovery due to this treatment will be evaluated using neurocognitive testing as well as functional and structural neuroimaging.

2012-2015 Internet Based Cognitive Behavioral Therapy Effects on Depressive Cognitions and Brain function.
U.S. Army Medical Research and Materiel Command (USAMRMC),
Co-PI: Killgore (Total Award: $1,646,045)
Major Goal: To evaluate the effectiveness of an internet-based cognitive behavioral therapy treatment program on improving depressive symptoms, coping and resilience skills, cognitive processing and functional brain activation patterns within the prefrontal cortex.

2012-2014 Multimodal Neuroimaging to Predict Cognitive Resilience Against Sleep Loss
Defense Advance Research Projects Agency (DARPA) Young Faculty Award in

Neuroscience
P.I.: Killgore (Total Award: $445,531)
Major Goal: To combine several neuroimaging techniques, including functional and structural magnetic resonance imaging, diffusion tensor imaging, and magnetic resonance spectroscopy to predict individual resilience to 24 hours of sleep deprivation.

2012-2016 A Model for Predicting Cognitive and Emotional Health from Structural and Functional Neurocircuitry following Traumatic Brain Injury
Congressionally Directed Medical Research Program (CDMRP), Psychological Health/Traumatic Brain Injury (PH/TBI) Research Program: Applied Neurotrauma Research Award.
P.I.: Killgore (Total Award: $2,272,098)
Major Goal: To evaluate the relation between axonal damage and neurocognitive performance in patients with traumatic brain injury at multiple points over the recovery trajectory, in order to predict recovery.

2012-2014 Neural Mechanisms of Fear Extinction Across Anxiety Disorders
NIH NIMH
Site Subcontract PI: Killgore (Subcontract Award: $505,065)
Major Goal: To examine the neurocircuitry involved in fear conditioning, extinction, and extinction recall across several major anxiety disorders.

2014-2017 Bright Light Therapy for Treatment of Sleep Problems following Mild TBI.
Psychological Health and Traumatic Brain Injury Research Program (PH/TBI RP) Traumatic Brain Injury Research Award-Clinical Trial.
P.I.: Killgore (Total Award: $1,853,921)
Major Goal: To verify the effectiveness of morning exposure to bright light as a treatment for improving in sleep patterns, neurocognitive performance, brain function, and brain structure among individuals with a recent mild traumatic brain injury.

2014-2018 A Non-pharmacologic Method for Enhancing Sleep in PTSD
Military Operational Medicine Research Program (MOMRP) Joint Program Committee 5 (JPC-5), FY13 Basic and Applied Psychological Health Award (BAPHA)
P.I.: Killgore (Total Award: $3,821,415)
Major Goal: To evaluate the effectiveness of blue light exposure to modify sleep in PTSD and its effects on fear conditioning/extinction, symptom expression, and brain functioning.

2015 Effects of Blue Light on Melatonin Levels and EEG Power Density Spectrum
Arizona Area Health Education Centers (AHEC) Program
Co-PI: Killgore (Total Award: 4,373)
Major Goal: Adjunctive intramural funding to add a melatonin collection to an ongoing study of the effects of blue wavelength light on alertness and brain function.

Report of Local Teaching and Training

Laboratory and Other Research Supervisory and Training Responsibilities

2005-2006 1 Fellow for 250 hrs/year, Neuropsychology Postdoctoral Research Training Program

Supervisor, Walter Reed Hospital

2011- 2 Fellows for 2080 hrs/year, Harvard Research Fellow Supervisor, McLean Hospital

Formally Supervised Trainees

1997-1999 David Glahn, Ph.D. Associate Professor, Yale University School of Medicine
Provided mentorship in clinical neuropsychological assessment and research at the University of Pennsylvania Hospital, which resulted in the development of a new psychometric test, 1 co-authored published conference abstract, and 1 co-authored published journal article.

1997-1999 Daniel Casasanto, Ph.D. Assistant Professor, University of Chicago
Supervised this trainee while at the University of Pennsylvania Hospital, which resulted in the development of a new psychometric test, 9 co-authored published conference abstracts, and 5 co-authored published journal articles.

2002-2005 Alexander Vo, Ph.D. Associate Professor, UTMB; Vice President, Electronically Mediated Services, Colorado Access
Served as one of his research mentors at the Walter Reed Army Institute of Research, which resulted in 3 co-authored published conference abstracts, and 3 co-authored published journal articles.

2002-2007 Rebecca Reichardt, M.A. Human Subjects Protection Scientist, USAMRMC
Supervised her research training in my lab at the Walter Reed Army Institute of Research, which resulted in 10 co-authored published conference abstracts, and 2 co-authored published journal articles.

2003-2004 Stan Liu, M.D. Medical Intern, Johns Hopkins Medical School
Supervised his research training in my lab at the Walter Reed Army Institute of Research, which primarily involved training in neuropsychological assessment and sleep research methods.

2003-2004 Neil Arora, B.A. Student, Yale University
Supervised his research project in my lab at the Walter Reed Army Institute of Research and NIH, which primarily involved training in brain imaging analysis and led to 2 co-authored published conference abstracts.

2003-2005 Nancy Grugle, Ph.D. Assistant Professor, Cleveland State University
Supervised her Doctoral Dissertation research project in my lab at the Walter Reed Army Institute of Research, which resulted in 23 co-authored published conference abstracts, and 10 co-authored published journal articles.

2003-2005 Joshua Bailey, B.A. Seminary Student
Supervised his computer programing development and research in my lab at the Walter Reed Army Institute of Research, which resulted in 1 co-authored published conference abstract, and 1 co-authored computer analysis package submitted for U.S. patent.

2003-2006 Athena Kendall, M.A. Lab Manager, Walter Reed Army Medical Center
Supervised part of her masters degree research project and other research work in my lab at the Walter Reed Army Institute of Research, which resulted in 4 co-authored published conference abstracts, and 4 co-authored published journal articles.

2003-2006 Lisa Day, M.S.W. Clinical Social Worker, Washington D.C.
Supervised her research training and work in my lab at the Walter Reed Army Institute of Research, which resulted in 3 co-authored published conference abstracts, and 1 co-authored published journal article.

2004-2005 Merica Shepherd, B.A. Laboratory Coordinator
Supervised her research training in my lab at the Walter Reed Army Institute of Research, which primarily involved training in neuropsychological assessment and sleep research methods.

2004-2005 Cynthia Hawes, B.A. Research Program Coordinator
Supervised her research training in my lab at the Walter Reed Army Institute of Research, which primarily involved training in neuropsychological assessment and sleep research methods.

2004-2006 Christopher Li, B.A. Graduate Student
Supervised his research training and work in my lab at the Walter Reed Army Institute of Research, which resulted in 3 co-authored published conference abstracts, and 1 co-authored published journal article.

2004-2007 Jessica Richards, M.S. Ph.D. Student, University of Maryland College Park
Served as Chair of her Senior Honors Thesis Committee and supervised her research work in my lab at the Walter Reed Army Institute of Research, which resulted in 8 co-authored published conference abstracts, a senior honors thesis, and 2 co-authored published journal articles.

2004-2007 Erica Lipizzi, M.A. Graduate Student, Emory University
Supervised her research training and work in my lab at the Walter Reed Army Institute of Research, which resulted in 16 co-authored published conference abstracts, and 12 co-authored published journal articles.

2004-2007 Brian Leavitt, B.S. Research Technician, Walter Reed Army Institute of Research
Supervised his research training and work in my lab at the Walter Reed Army Institute of Research, which resulted in 4 co-authored published conference abstracts, and 1 co-authored published journal article.

2004-2007 Rachel Newman, M.S. Senior Laboratory Manager, Walter Reed
Supervised her research training and work in my lab at the Walter Reed Army Institute of Research, which resulted in 6 co-authored published conference abstracts, and 1 co-authored published journal article.

2004-2007 Alexandra Krugler, B.S. Medical Student, Louisiana State University
Supervised her research training and work in my lab at the Walter Reed Army Institute of Research, which resulted in 5 co-authored published conference abstracts, and 1 co-authored published journal article.

2005 Amy Conrad, PH.D. Clinical Psychologist, Washington D.C.
Supervised her research training and work in my lab at the Walter Reed Army Institute of Research, which resulted in 4 co-authored published conference abstracts, and 1 co-authored published journal article.

2005-2006 Nathan Huck, PH.D. Clinical Neuropsychologist, Walter Reed Army Institute of Research
Served as his post-doctoral research training supervisor at the Walter Reed Army Institute of Research, which resulted in 1 co-authored published conference abstract and 1 co-authored published journal article.

2005-2006 Ellen Kahn-Greene, Ph.D. Post-Doctoral Fellow, Boston VA
Supervised her research training and work in my lab at the Walter Reed Army Institute of Research, which resulted in 7 co-authored published conference abstracts and 5 co-authored published journal articles.

2005-2006 Alison Muckle, B.A. Research Technician

Supervised her research training and work in my lab at the Walter Reed Army Institute of Research, which resulted in 1 co-authored published conference abstract and 1 co-authored published journal article.

2005-2006 Christina Murray, B.S. Medical Student, Drexel University
Supervised her research training and work in my lab at the Walter Reed Army Institute of Research, which resulted in 2 co-authored published conference abstracts.

2005-2007 Gautham Ganesan, M.D. Medical Student, UC Irvine
Supervised his research training and work in my lab at the Walter Reed Army Institute of Research, which resulted in 1 co-authored published conference abstract and 1 co-authored published journal article.

2005-2007 Dante Picchioni, Ph.D. Research Psychologist, Walter Reed Army Institute of Research
Supervised part of his post-doctoral brain imaging research training at the Walter Reed Army Institute of Research, which resulted in 1 co-authored published conference abstract and 1 co-authored published journal article.

2006-2007 Tracy Rupp, Ph.D. Research Psychologist, Walter Reed Army Institute of Research
Supervised part of her post-doctoral sleep research training at the Walter Reed Army Institute of Research, which resulted in 17 co-authored conference abstracts and 2 co-authored published journal articles.

2006-2007 Kacie Smith, B.A. Study Manager, Walter Reed Army Institute of Research
Supervised her research training and work in my lab at the Walter Reed Army Institute of Research, which resulted in 7 co-authored published conference abstracts.

2006-2007 Shane Smith, B.S. Medical Student, University of the West Indies
Served as his research mentor at the Walter Reed Army Institute of Research, which primarily involved training in neuropsychological assessment and sleep research methods.

2006-2007 Shanelle McNair Research Technician, Walter Reed Army Institute of Research
Supervised her research training and work in my lab at the Walter Reed Army Institute of Research, which resulted in 1 co-authored published article.

2006-2007 George Watlington Research Technician, Walter Reed Army Institute of Research
Supervised his research training and work in my lab at the Walter Reed Army Institute of Research, which resulted in 1 co-authored published article.

2008 Grady O'Brien Undergraduate Student
Served as his summer volunteer research mentor at McLean Hospital, which resulted in 1 oral research presentation

2008-2009 Alex Post Undergraduate Student, Carnegie Mellon University
Served as his summer volunteer research mentor at McLean Hospital, which resulted in 2 oral research presentations and 1 co-authored published abstract.

2008-2009 Lauren Price, B.A. Senior Clinical Research Assistant, McLean Hospital
Supervised her research training and work in my lab at the McLean Hospital, which resulted in 11 co-authored published conference abstracts and 4 co-authored published articles.

2009-2013 Zachary Schwab, B.S. Medical Student, University of Kansas
Supervised his research training and work in my lab at the McLean Hospital, which resulted in 79 co-authored published conference abstracts and 15 co-authored published articles.

2009-2011 Melissa Weiner, B.S. Graduate Student, Yale School of Public Health
Supervised her research training and work in my lab at the McLean Hospital, which resulted in 35 co-authored published conference abstracts and 7 co-authored published articles.

2010-2011 Norah Simpson, Ph.D. Post-Doctoral Fellow, Beth Israel Deaconess/Harvard Medical School
Served as a research mentor on her federal K-Award grant application.

2010-2012 Vincent Capaldi, M.D. Medical Resident, Walter Reed Army Medical Ctr.
Served as his post-doctoral research mentor, which resulted in 1 co-authored published conference abstract and 2 co-authored published articles.

2010-2011 Christina Song Undergraduate Student, Smith College
Served as her summer volunteer research mentor at McLean Hospital, which resulted in 1 co-authored published abstract.

2011 Jill Kizielewicz Undergraduate Student, Hamilton College
Served as her summer volunteer research mentor at McLean Hospital, which resulted in 1 co-authored published abstract.

2011-2013 Sophie DelDonno, B.A. Doctoral Student, University of Illinois, Chicago
Supervised her research training and work in my lab at the McLean Hospital, which resulted in 34 co-authored published conference abstracts and 9 co-authored published articles.

2011- Maia Kipman, B.A. Research Assistant, McLean Hospital
Supervised her research training and work in my lab at the McLean Hospital, which resulted in 42 co-authored published conference abstracts and 10 co-authored published articles.

2011 Michael Covell, B.A. Graduate Student, Baruch College
Served as one of his research mentors at McLean Hospital, which resulted in 4 co-authored published conference abstracts, and 1 co-authored published article.

2011- Mareen Weber, Ph.D. Instructor, Harvard Medical School
Supervised her post-doctoral research training and work in my lab at the McLean Hospital, which has resulted in 49 co-authored published conference abstracts, 15 co-authored published articles, 1co-authored book chapter, 1 travel award, five federal grant submissions, and 2 successfully funded grants.

2012- Julia Cohen, Ph.D. Post-Doctoral Fellow, Harvard Medical School
Served as one of her research mentors at McLean Hospital, which resulted in 6 co-authored published conference abstracts and 1 peer-reviewed publication.

2012- Christian Webb, Ph.D. Post-Doctoral Fellow, Harvard Medical School
Currently supervising his post-doctoral research training and work in my lab at the McLean Hospital, which has resulted in 9 co-authored published conference abstracts and 6 peer-reviewed publications.

2012- Hannah Gogel, B.S. Research Assistant, McLean Hospital
Supervised her research training and work in my lab at the McLean Hospital, which resulted in 21 co-authored published conference abstracts and 4 co-authored published articles.

2012- Olga Tkachenko, A.B. Research Assistant, McLean Hospital
Supervised her research training and work in my lab at the McLean Hospital, which resulted in 23 co-authored published conference abstracts and 4 co-authored published articles.

2012- Lilly Preer, B.A. Research Assistant, McLean Hospital

Supervised her research training and work in my lab at the McLean Hospital, which resulted in 22 co-authored published conference abstracts and 3 co-authored published articles.

2012-2013 Elizabeth Mundy, Ph.D Postdoctoral Fellow, Harvard Medical School
Supervised her post-doctoral research training and work in my lab at the McLean Hospital, which resulted in 3 co-authored published conference abstracts and 2 co-authored published articles.

2012- John S. Bark, B.A. Lab Volunteer, McLean Hospital
Supervised his research training and work in my lab at the McLean Hospital, which resulted in 5 co-authored published conference abstracts, and 2 co-authored published articles.

2013- Shreya Divatia, B.S. Research Assistant, McLean Hospital
Supervised her research training and work in my lab at the McLean Hospital, which resulted in 9 co-authored published conference abstracts.

2013- Lauren Demers, B.A. Research Assistant, McLean Hospital
Supervised her research training and work in my lab at the McLean Hospital, which resulted in 10 co-authored published conference abstracts.

2013- Jiaolong Cui, Ph.D Postdoctoral Fellow, Harvard Medical School
Supervised his post-doctoral research training and work in my lab at the McLean Hospital, which resulted in 9 co-authored published conference abstracts.

2013-2014 Allison Jorgensen Lab Volunteer, McLean Hospital
Supervised her research training and work in my lab at the McLean Hospital, which resulted in 2 co-authored published conference abstracts.

2013 Leslie Amrein Lab Volunteer, McLean Hospital
Supervised her research training and work in my lab at the McLean Hospital.

2013 Alexa Curhan Lab Volunteer, McLean Hospital
Supervised her research training and work in my lab at the McLean Hospital.

2013-2014 Kate Manganello High School Lab Volunteer, McLean Hospital
Supervised her research training and work in my lab at the McLean Hospital.

2013-2014 Mia Kaminsky High School Lab Volunteer, McLean Hospital
Supervised her research training and work in my lab at the McLean Hospital.

2013-2014 Jennifer Buchholz Research Assistant, McLean Hospital
Supervised her research training and work in my lab at the McLean Hospital.

2014 Joseph Dagher, Ph.D. Assistant Professor, University of Arizona
Mentored his K-Award and CECS grant applications.

2014 Ryan Smith, B.S. PhD Candidate, University of Arizona
Mentored his F32- grant application.

2014 John Vanuk, B.A. Research Assistant, University of Arizona
Supervised his research training in my lab.

2014 Sarah Markowski Research Assistant, University of Arizona
Supervised her research training in my lab.

2014 Derek Pisner, B.S. Research Assistant, University of Arizona
Supervised his research training in my lab.

2014 Bradley Shane, B.S. Research Assistant, University of Arizona
Supervised his research training in my lab.

2014 Andrew Fridman, B.A. Research Assistant, University of Arizona
Supervised his research training in my lab.

2014 Anna Alkozei, Ph.D. Postdoctoral Fellow, University of Arizona

Supervised her post-doctoral research training and work in my lab.

Local Invited Presentations

2000 The Neurobiology of Emotion in Children, McLean Hospital
Lecturer: 30 participants, 2 hours contact time per year, 10 hours prep time per year. *[Invited Lecture]*

2001 The Neurobiology of Emotion in Children and Adolescents, McLean Hospital
Lecturer: 60 participants, 2 hours contact time per year, 10 hours prep time per year. *[Invited Lecture]*

2001 Using Functional MRI to Study the Developing Brain, Judge Baker Children's Center
Lecturer: 8 participants, 2 hours contact time per year, 10 hours prep time per year *[Invited Seminar]*

2005 Briefing to the Chairman of the Congressional Committee on Strategies to Protect the Health of Deployed U.S. Forces, John H. Moxley, on the Optimization of Judgment and Decision Making Capacities in Soldiers Following Sleep Deprivation, Walter Reed Army Institute of Research, Washington, DC*[Invited Lecture]*

2005 Lecture on Functional Neuroimaging, Cognitive Assessment, and the Enhancement of Soldier Performance, Walter Reed Army Institute of Research, Washington, DC *[Invited Lecture]*

2006 Lecture on Optimization of Judgment and Decision Making Capacities in Soldiers Following Sleep Deprivation, Brain Imaging Center, McLean Hospital, Belmont MA *[Invited Lecture]*

2006 Briefing to the Chairman of the Cognitive Performance Assessment Program Area Steering Committee, U.S. Army Military Operational Medicine Research Program, entitled Optimization of Judgment and Decision Making Capacities in Soldiers Following Sleep Deprivation, Walter Reed Army Institute of Research *[Invited Lecture]*

2010 Lecture on Patterns of Cortico-Limbic Activation Across Anxiety Disorders, Center for Anxiety, Depression, and Stress, McLean Hospital, Belmont, MA *[Invited Lecture]*

2010 Lecture on Cortico-Limbic Activation Among Anxiety Disorders, Neuroimaging Center, McLean Hospital, Belmont, MA *[Invited Lecture]*

2011 Lecture on Shared and Differential Patterns of Cortico-Limbic Activation Across Anxiety Disorders, McLean Research Day Brief Communications, McLean Hospital, Belmont, MA *[Invited Lecture]*

2012 Briefing to GEN (Ret) George Casey Jr., former Chief of Staff of the U.S. Army, entitled Research for the Soldier. McLean Hospital, Belmont, MA. *[Invited Lecture]*

2014 Lecture entitled Sleep Loss, Brain Function, and Cognitive Performance, presented to the Psychiatric Genetics and Translational Research Seminar, Massachusetts General

Hospital/Harvard Medical School, Boston, MA *[Invited Lecture]*

2014 Grand Rounds Lecture entitled Sleep Loss, Brain Function, and Performance of the Emotional-Executive System. University of Arizona Psychiatry Grand Rounds, Tucson, AZ *[Invited Lecture]*

2014 Psychology Department Colloquium entitled Sleep Loss, Brain Function, and Performance of the Emotional-Executive System. University of Arizona Department of Psychology, Tucson, AZ *[Invited Lecture]*

2014 Lecture entitled Supporting Cognitive and Emotional Health in Warfighters. Presented to the Senior Vice President for the Senior Vice President for Health Sciences and Dean of the Medical School, University of Arizona, Tucson, AZ *[Invited Lecture]*

Report of Regional, National and International Invited Teaching and Presentations

Invited Presentations and Courses

Regional

2002 Cortico-Limbic Activation in Adolescence and Adulthood, Youth Advocacy Project, Cape Cod, MA
Lecturer: 45 participants, 2 hours contact time per year, 10 hours prep time per year
[Invited Lecture]

2006 Lecture on Norming a Battery of Tasks to Measure the Cognitive Effects of Operationally Relevant Stressors, Cognitive Performance Assessment Program Area Steering Committee, U.S. Army Military Operational Medicine Research Program, Washington, DC*[Invited Lecture]*

2007 Lecture on Cerebral Responses During Visual Processing of Food, U.S. Army Institute of Environmental Medicine, Natick, MA*[Invited Lecture]*

2007 Briefing on the Measurement of Sleep-Wake Cycles and Cognitive Performance in Combat Aviators, U.S. Department of Defense, Defense Advanced Research Projects Agency (DARPA), Washington, DC

2008 Lecture on Sleep Deprivation, Executive Function, and Resilience to Sleep Loss; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA *[Invited Lecture]*

2008 Lecture on the Role of Research Psychology in the Army; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA*[Invited Lecture]*

2008 Lecture on Combat Stress Control: Basic Battlemind Training; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA*[Invited Lecture]*

2009 Lecture entitled Evaluate a Casualty, Prevent Shock, and Prevent Cold Weather injuries;

105th IMA Detachment, U.S. Army Reserve Center, Boston, MA*[Invited Lecture]*

2009 Lecture on Combat Exposure and Sleep Deprivation Effects on Risky Decision-Making; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA *[Invited Lecture]*

2009 Lecture on the Sleep History and Readiness Predictor (SHARP); 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA *[Invited Lecture]*

2009 Lecture on The Use of Actigraphy for Measuring Sleep in Combat and Military Training; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA *[Invited Lecture]*

2010 Lecture entitled Casualty Evaluation; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA *[Invited Lecture]*

2010 Lecture entitled Combat Stress and Risk-Taking Behavior Following Deployment; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA *[Invited Lecture]*

2010 Lecture entitled Historical Perspectives on Combat Medicine at the Battle of Gettysburg; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA *[Invited Lecture]*

2010 Lecture entitled Sleep Loss, Stimulants, and Decision-Making; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA *[Invited Lecture]*

2010 Lecture entitled PTSD: New Insights from Brain Imaging; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA *[Invited Lecture]*

2011 Lecture entitled Effects of bright light therapy on sleep, cognition and brain function after mild traumatic brain injury; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA *[Invited Lecture]*

2011 Lecture entitled Laboratory Sciences and Research Psychology in the Army; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA *[Invited Lecture]*

2011 Lecture entitled Tools for Assessing Sleep in Military Settings; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA *[Invited Lecture]*

2011 Lecture entitled The Brain Basis of Emotional Trauma and Practical Issues in Supporting Victims of Trauma, U.S. Department of Justice, United States Attorneys Office, Serving Victims of Crime Training Program, Holyoke, MA *[Invited Lecture]*

2011 Lecture entitled The Brain Altering Effects of Traumatic Experiences; 105th Reinforcement Training Unit (RTU), U.S. Army Reserve Center, Boston, MA *[Invited Lecture]*

2012 Lecture entitled Sleep Loss, Caffeine, and Military Performance; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA *[Invited Lecture]*

2012 Lecture entitled Using Light Therapy to Treat Sleep Disturbance Following Concussion;

105th IMA Detachment, U.S. Army Reserve Center, Boston, MA *[Invited Lecture]*

2013 Lecture entitled Brain Responses to Food: What you See Could Make you Fat; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA *[Invited Lecture]*

2013 Lecture entitled Predicting Resilience Against Sleep Loss; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA *[Invited Lecture]*

2014 Lecture entitled Get Some Shut-Eye or Get Fat: Sleep Loss Affects Brain Responses to Food; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA *[Invited Lecture]*

2014 Lecture entitled Emotional Intelligence: Developing a Training Program; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA *[Invited Lecture]*

National

2000 Lecture on the Neurobiology of Emotional Development in Children, 9th Annual Parents as Teachers Born to Learn Conference, St. Louis, MO *[Invited Lecture]*

2002 Lecture on the Changes in the Lateralized Structure and Function of the Brain during Adolescent Development, Walter Reed Army Institute of Research, Washington, DC*[Invited Lecture]*

2004 Lecture on Sleep Deprivation, Cognition, and Stimulant Countermeasures: Seminar Presented at the Bi-Annual 71F Research Psychology Short Course, Ft. Detrick, MD, U.S. Army Medical Research and Materiel Command *[Invited Lecture]*

2004 Lecture on the Regional Cerebral Blood Flow Correlates of Electroencephalographic Activity During Stage 2 and Slow Wave Sleep: An H215O PET Study: Presented at the Bi-Annual 71F Research Psychology Short Course, Ft. Detrick, MD, U.S. Army Medical Research and Materiel Command*[Invited Lecture]*

2004 Oral Platform Presentation: Regional cerebral metabolic correlates of electroencephalographic activity during stage-2 and slow-wave sleep: An H215O PET Study, 18th Associated Professional Sleep Societies Annual Meeting, Philadelphia, PA.

2005 Lecture on The Sleep History and Readiness Predictor: Presented to the Medical Research and Materiel Command, Ft. Detrick, MD*[Invited Lecture]*

2006 Lecture on The Sleep History and Readiness Predictor: Presented at the Bi-Annual 71F Research Psychology Short Course, Ft. Rucker, AL, U.S. Army Medical Research and Materiel Command*[Invited Lecture]*

2007 Lecture on the Effects of Fatigue and Pharmacological Countermeasures on Judgment and Decision-Making, U.S. Army Aeromedical Research Laboratory, Fort Rucker, AL *[Invited Lecture]*

2008 Lecture on the Validation of Actigraphy and the SHARP as Methods of Measuring Sleep and Performance in Soldiers, U.S. Army Aeromedical Research

Laboratory, Fort Rucker, AL*[Seminar]*

2009 Lecture on Sleep Deprivation, Executive Function, and Resilience to Sleep Loss: Walter Reed Army Institute of Research AIBS Review, Washington DC*[Invited Lecture]*

2009 Lecture Entitled: Influences of Combat Exposure and Sleep Deprivation on Risky Decision-Making, Evans U.S. Army Hospital, Fort Carson, CO*[Invited Lecture]*

2009 Lecture on Making Bad Choices: The Effects of Combat Exposure and Sleep Deprivation on Risky Decision-Making, 4th Army, Division West, Quarterly Safety Briefing to the Commanding General and Staff, Fort Carson, CO*[Invited Lecture]*

2009 Symposium Entitled: Sleep Deprivation, Judgment, and Decision-Making, 23rd Annual Meeting of the Associated Professional Sleep Societies, Seattle, WA *[Invited Symposium]*

2009 Symposium Session Moderator: Workshop on Components of Cognition and Fatigue: From Laboratory Experiments to Mathematical Modeling and Operational Applications, Washington State University, Spokane, WA *[Invited Speaker]*

2009 Lecture on Comparative Studies of Stimulant Action as Countermeasures for Higher Order Cognition and Executive Function Impairment that Results from Disrupted Sleep Patterns, Presented at the NIDA-ODS Symposium entitled: Caffeine: Is the Next Problem Already Brewing, Rockville, MD *[Invited Lecture]*

2010 Oral Platform Presentation: Sleep deprivation selectively impairs emotional aspects of cognitive functioning, 27th Army Science Conference, Orlando, FL.

2010 Oral Platform Presentation: Exaggerated amygdala responses to masked fearful faces are specific to PTSD versus simple phobia, 27th Army Science Conference, Orlando, FL.

2011 Lecture Entitled: The effects of emotional intelligence on judgment and decision making, Military Operational Medicine Research Program Task Area C, R & A Briefing, Walter Reed Army Institute of Research, Silver Spring, MD *[Invited Lecture]*

2011 Lecture Entitled: Effects of bright light therapy on sleep, cognition, brain function, and neurochemistry following mild traumatic brain injury, Military Operational Medicine Research Program Task Area C, R & A Briefing, Walter Reed Army Institute of Research, Silver Spring, MD *[Invited Lecture]*

2012 Oral Symposium Presentation: Shared and distinctive patterns of cortico-limbic activation across anxiety disorders, 32nd Annual Conference of the Anxiety Disorders Association of America, Arlington, VA. *[Invited Symposium]*

2012 Lecture Entitled: Effects of bright light therapy on sleep, cognition, brain function, and neurochemistry following mild traumatic brain injury, Military Operational Medicine Research Program In Progress Review (IPR) Briefing, U.S. Army Medical Research and Materiel Command, Fort Detrick, MD *[Invited Lecture]*

2013 Lecture entitled Brain responses to visual images of food: Could your eyes be the gateway to excess? Presented to the NIH Nutrition Coordinating Committee and the Assistant Surgeon General of the United States, Bethesda, MD *[Invited Lecture]*

2013 Lecture Entitled: Update on the Effects of Bright light therapy on sleep, cognition, brain function, and neurochemistry following mild traumatic brain injury, Military Operational Medicine Research Program In Progress Review (IPR) Briefing, U.S. Army Medical Research and Materiel Command, Fort Detrick, MD *[Invited Lecture]*

2013 Lecture Entitled: Internet Based Cognitive Behavioral Therapy: Effects on Depressive Cognitions and Brain Function, Military Operational Medicine Research Program In Progress Review (IPR) Briefing, U.S. Army Medical Research and Materiel Command, Fort Detrick, MD [*Invited Lecture*]

2013 Symposium Entitled: Predicting Resilience Against Sleep Loss, United States Military Academy at West Point, West Point, NY [*Invited Symposium*].

2014 Symposium Entitled: Operating Under the Influence: The Effects of Sleep Loss and Stimulants on Decision-Making and Performance, Invited Faculty Presenter at the 34th Annual Cardiothoracic Surgery Symposium (CREF), San Diego, CA [*Invited Symposium*].

2014 Symposium Entitled: The Effects of Sleep Loss on Food Preference, SLEEP 2014, Minneapolis, MN *[Invited Symposium]*

2014 Lecture Entitled: Internet Based Cognitive Behavioral Therapy: Effects on Depressive Cognitions and Brain Function, Military Operational Medicine Research Program In Progress Review (IPR) Briefing, U.S. Army Medical Research and Materiel Command, Fort Detrick, MD *[Invited Lecture]*

2014 Lecture Entitled: The Neurobiological Basis and Potential Modification of Emotional Intelligence Through Affective/Behavioral Training, Military Operational Medicine Research Program In Progress Review (IPR) Briefing, U.S. Army Medical Research and Materiel Command, Fort Detrick, MD *[Invited Lecture]*

2015 Lecture Entitled: The Neurobiological Basis and Potential Modification of Emotional Intelligence in Military Personnel. Invited presentation at the Yale Center for Emotional Intelligence, New Haven, CT *[Invited Symposium]*

International

1999 Oral Platform Presentation: Functional MRI lateralization during memory encoding predicts seizure outcome following anterior temporal lobectomy, 27th Annual Meeting of the International Neuropsychological Society, Boston, MA.

2001 Oral Platform Presentation: Sex differences in functional activation of the amygdala during the perception of happy faces, 29th Annual Meeting of the International Neuropsychological Society, Chicago, IL.

2002 Oral Platform Presentation: Developmental changes in the lateralized activation of the prefrontal cortex and amygdala during the processing of facial affect, 30th Annual Meeting of the International Neuropsychological Society, Toronto, Ontario, Canada.

2002 Oral Platform Presentation: Gray and white matter volume during adolescence correlates with cognitive performance: A morphometric MRI study, 30th Annual Meeting of the International Neuropsychological Society, Toronto, Ontario, Canada.

2007 Symposium on Cortical and Limbic Activation in Response to Visual Images of Low and High-Caloric Foods, 6th Annual Meeting of the International Society for Behavioral Nutrition and Physical Activity (ISBNPA), Oslo, Norway *[Invited Lecture]*

2008 Lecture on Sleep Deprivation, Executive Function, & Resilience to Sleep Loss, First Franco-American Workshop on War Traumatism, IMNSSA, Toulon, France *[Invited Lecture]*

2012 Oral Platform Presentation: Shared and unique patterns of cortico-limbic activation across anxiety disorders. 40th Meeting of the International Neuropsychological Society, Montreal, Canada.

Report of Clinical Activities and Innovations

Current Licensure and Certification

2001- Clinical Psychologist, New Hampshire

Practice Activities

1991-1995 Psychology, Clinical, Psychology Clinic, Texas Tech University, Lubbock, TX
Clinical Activity Description: Provided psychotherapy and other supervised psychological services for a broad spectrum of client problems. Duties included regular therapy contacts with four to eight clients per week for approximately four years. Clients ranged in age from preschool through middle age. Clinical responsibilities included intake evaluations, formal testing and assessment, case formulation and treatment plan development, and delivery of a wide range of psychotherapy services including crisis intervention, behavior modification, short-term cognitive restructuring, and long-term psychotherapy.
Patient Load: 6/week

1993-1995 Psychology, Neuropsychology, Methodist Hospital Rehabilitation Institute, Lubbock, TX
Clinical Activity Description: A two year placement consisting of two days per week within a large rehabilitation unit of a major regional medical center. Responsibilities included administration, scoring, and writing of neuropsychological assessments/reports, primarily emphasizing the Halstead-Reitan Neuropsychological Battery. Assessment services were provided on both inpatient and outpatient basis.
Patient Load: 2/week

1995-1996 Psychology, Neuropsychology, Yale University School of Medicine, Connecticut Mental Health Center
Clinical Activity Description: Neuropsychological and psychodiagnostic assessment of chronic and severe mentally ill patients. Duties included patient interviewing, test administration, scoring, interpretation, and report writing. Assessment and consultation services were provided for both the inpatient and outpatient units.
Patient Load: 2/week

1995-1996 Psychology, Clinical, Yale University School of Medicine, West Haven Mental Health Clinic
Clinical Activity Description: Provided short-term, long-term, and group psychotherapy services, consultation, and psychological assessments for adults, children, and families. Duties also included co-leading a regular outpatient group devoted to treatment of moderate to severe personality disorders.
Patient Load: 12/week

1996-1997 Psychology, Neuropsychology, University of Oklahoma Health Sciences Center
Clinical Activity Description: Full-time placement in the Neuropsychological Assessment Laboratory, which meets INS/Division 40 guidelines for post-doctoral training in clinical neuropsychology. Responsibilities included comprehensive neuropsychological assessment and consultation services, including test administration, scoring, interpretation, and report writing. Regular outpatient psychotherapy was also provided for approximately two patients per week.
Patient Load: 4/week

1997-1999 Psychology, Neuropsychology, University of Pennsylvania Medical Center
Clinical Activity Description: Full-time two-year placement in the Department of Neurology,

which meets INS/Division 40 guidelines for post-doctoral training in clinical neuropsychology. Responsibilities included neuropsychological assessment, consultation, and psychotherapy services for the Departments of Neurology and Neurosurgery.
Patient Load: 3/week

Report of Education of Patients and Service to the Community

Recognition

2003-2007 Who's Who in America, Marquis Who's Who
2004-2005 Who's Who in Medicine and Healthcare, Marquis Who's Who

Report of Scholarship

Publications

Peer reviewed publications in print or other media

A) Research Investigations:

1. **Killgore WD**. The Affect Grid: a moderately valid, nonspecific measure of pleasure and arousal. Psychol Rep. 83(2):639-42, 1998.

2. **Killgore WD**. Empirically derived factor indices for the Beck Depression Inventory. Psychol Rep. 84(3 Pt 1):1005-13, 1999.

3. **Killgore WD**. Affective valence and arousal in self-rated depression and anxiety. Percept Mot Skills. 89(1):301-4, 1999.

4. **Killgore WD**, Adams RL. Prediction of Boston Naming Test performance from vocabulary scores: preliminary guidelines for interpretation. Percept Mot Skills. 89(1):327-37, 1999.

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1. **Killgore, WD**, Estrada, A, Rouse, T, Wildzunas, RM, Balkin, TJ. Sleep and performance measures in soldiers undergoing military relevant training. USAARL Report No. 2009-13. June, 2009.

2. Kelley, AM, **Killgore, WD**, Athy, JR, Dretsch, M. Risk propensity, risk perception, and sensation seeking in U.S. Army Soldiers: A preliminary study of a risk assessment battery. USAARL Report No. 2010-02. DTIC #: ADA511524. October, 2009.

Professional educational materials or reports, in print or other media

1. **Killgore, WD,** & Bailey, JD. Sleep History And Readiness Predictor (SHARP). Silver Spring, MD: Walter Reed Army Institute of Research; 2006. Computer program for predicting cognitive status based on actigraphically recorded sleep history. Patent Pending.

Thesis

1. **Killgore, WD.** Senior Honors Thesis: Perceived intensity of lateral facial asymmetry of spontaneous vs. posed emotional expressions. Albuquerque, NM: University of New Mexico;1990. **(Outstanding Psychology Senior Honors Thesis, UNM-1990).*

2. **Killgore, WD.** Masters Thesis: Interaction of visual field and lateral facial asymmetry on the perceived intensity of emotional expressions in depressed and non-depressed subjects. Lubbock, TX: Texas Tech University;1992.

3. **Killgore, WD.** Dissertation: Development and validation of a new instrument for the measurement of transient mood states: The facial analogue mood scale (FAMS). Lubbock, TX: Texas Tech University;1995.

Abstracts, Poster Presentations and Exhibits Presented at Professional Meetings

1. **Killgore, WD.** Development and validation of a new instrument for the measurement of transient mood states: The facial analogue mood scale (FAMS) [Abstract]. Dissertation Abstracts International: Section B: The Sciences & Engineering 1995; 56 (6-B): 3500.

2. **Killgore, WDS,** & Locke, B. A nonverbal instrument for the measurement of transient mood states: The Facial Analogue Mood Scale (FAMS) [Abstract]. Proceedings of the Annual Conference of the Oklahoma Center for Neurosciences 1996, Oklahoma City, OK.

3. **Killgore, WDS,** Scott, JG, Oommen, KJ, & Jones, H. Lateralization of seizure focus and performance on the MMPI-2 [Abstract]. Proceedings of the Annual Conference of the Oklahoma Center for Neurosciences 1996, Oklahoma City, OK.

4. **Killgore, WDS,** & Adams, RL. Vocabulary ability and Boston Naming Test performance: Preliminary guidelines for interpretation [Abstract]. Archives of Clinical Neuropsychology 1997; 13(1).

5. **Killgore, WDS**, Glosser, G, Cooke, AN, Grossman, M, Maldjian, J, Judy, K, Baltuch, G, King, D, Alsop, D, & Detre, JA. Functional activation during verbal memory encoding in patients with lateralized focal lesions [Abstract]. Epilepsia 1998; 39(Suppl. 6): 99.

6. **Killgore, WDS.** A new method for assessing subtle cognitive deficits: The Clock Trail Making Test [Abstract]. Archives of Clinical Neuropsychology 1998; 14(1): 92.

7. **Killgore, WDS,** & DellaPietra, L. Item response biases on the WMS-III Auditory Delayed Recognition Subtests [Abstract]. Archives of Clinical Neuropsychology 1998; 14(1): 92.

8. **Killgore, WDS,** Glosser, G, Alsop, DC, Cooke, AN, McSorley, C, Grossman, M, & Detre, JA. Functional activation during material specific memory encoding [Abstract]. NeuroImage 1998; 7: 811.

9. **Killgore, WDS,** & DellaPietra, L. Using the WMS-III to detect malingering: Empirical development of the Rarely Missed Index. [Abstract]. Journal of the International Neuropsychological Society 1999; 5(2).

10. **Killgore, WDS,** Glosser, G, & Detre, JA. Prediction of seizure outcome following anterior temporal lobectomy: fMRI vs. IAT [Abstract]. Archives of Clinical Neuropsychology 1999; 14(1): 143.

11. **Killgore, WDS,** Glosser, G, King, D, French, JA, Baltuch, G, & Detre, JA. Functional MRI lateralization during memory encoding predicts seizure outcome following anterior temporal lobectomy [Abstract]. Journal of the International Neuropsychological Society 1999; 5(2): 122.

12. **Killgore, WDS,** Casasanto, DJ, Maldjian, JA, Alsop, DC, Glosser, G, French, J, & Detre, J. A. Functional activation of mesial temporal lobe during nonverbal encoding [abstract]. Epilepsia, 1999; 40 (Supplement 7): 188.

13. **Killgore, WDS,** Casasanto, DJ, Maldjian, JA, Gonzales-Atavales, J, & Detre, JA. Associative memory for faces preferentially activates the left amygdala and hippocampus [abstract]. Journal of the International Neuropsychological Society, 2000; 6: 157.

14. Casasanto, DJ, **Killgore, WDS,** Maldjian, JA, Gonzales-Atavales, J, Glosser, G, & Detre, JA. Task-dependent and task-invariant activation in mesial temporal lobe structures during fMRI explicit encoding tasks [abstract]. Journal of the International Neuropsychological Society, 2000; 6: 134. ***[*Winner of Rennick Research Award]***.

15. **Killgore, WDS,** Glahn, D, & Casasanto, DJ. Development and validation of the Design Organization Test (DOT): A rapid screening instrument for assessing for visuospatial ability [abstract]. Journal of the International Neuropsychological Society, 2000; 6: 147.

16. Casasanto DJ, **Killgore, WDS,** Glosser, G, Maldjian, JA, & Detre, JA. Hemispheric specialization during episodic memory encoding in the human hippocampus and MTL. Proceedings of the Society for Cognitive Science 2000: Philadelphia, PA.

17. Casasanto, DJ, Glosser, G, **Killgore, WDS,** Siddiqi, F, Falk, M, Maldjian, J, Lev-Reis, I, & Detre, JA. FMRI evidence for the functional reserve model of post-ATL neuropsychological outcome prediction. Poster Presented at the David Mahoney Institute of Neurological Sciences 17th Annual Neuroscience Retreat, University of Pennsylvania, April 17, 2000.

18. Casasanto, DJ, **Killgore, WDS,** Maldjian, JA, Glosser, G, Grossman, M, Alsop, D. C, & Detre, JA. Neural Correlates of Successful and Unsuccessful Verbal Encoding [abstract].

Neuroimage, 2000 11: S381.

19. Siddiqui, F, Casasanto, DJ, **Killgore, WDS,** Detre, JA, Glosser, G, Alsop, DC, & Maldjian, JA. Hemispheric effects of frontal lobe tumors on mesial temporal lobe activation during scene encoding [abstract]. Neuroimage, 2000 11: S448.

20. Oki, M, Gruber, SA, **Killgore, WDS,** Yurgelun-Todd, DA. Bilateral thalamic activation occurs during lexical but not semantic processing [abstract]. Neuroimage, 2000 11: S353.

21. Yurgelun-Todd, DA, Gruber, SA, **Killgore, WDS,** & Tohen, M. Neuropsychological performance in first-episode bipolar disorder [Abstract]. Collegium Internationale Neuro-Psychopharmacologicum. Brussels, Belgium. July, 2000.

22. **Killgore, WDS,** & DellaPietra, L. Detecting malingering with the WMS-III: A revision of the Rarely Missed Index (RMI) [abstract]. Journal of the International Neuropsychological Society, 2001; 7 (2): 143-144.

23. Casasanto, DJ, Glosser, G, **Killgore, WDS,** Siddiqi, F, Falk, M, Roc, A, Maldjian, JA, Levy-Reis, I, Baltuch, G, & Detre, JA. Presurgical fMRI predicts memory outcome following anterior temporal lobectomy [abstract]. Journal of the International Neuropsychological Society, 2001; 7 (2): 183.

24. **Killgore, WDS,** & Yurgelun-Todd, DA. Amygdala but not hippocampal size predicts verbal memory performance in bipolar disorder [abstract]. Journal of the International Neuropsychological Society, 2001; 7 (2): 250-251.

25. **Killgore, WDS,** Kanayama, G, & Yurgelun-Todd, DA. Sex differences in functional activation of the amygdala during the perception of happy faces [abstract]. Journal of the International Neuropsychological Society, 2001; 7 (2): 198.

26. **Killgore, WDS,** Gruber, SA, Oki, M, & Yurgelun-Todd, DA. Amygdalar volume and verbal memory in schizophrenia and bipolar disorder: A correlative MRI study [abstract]. Meeting of the International Congress on Schizophrenia Research. Whistler, British Columbia. April 2001.

27. Kanayama, G, **Killgore, WDS,** Gruber, SA, & Yurgelun-Todd, DA. FMRI BOLD activation of the supramarginal gyrus in schizophrenia [abstract]. Meeting of the International Congress on Schizophrenia Research. Whistler, British Columbia. April 2001.

28. Gruber, SA, **Killgore, WDS,** Renshaw, PF, Pope, HG. Jr, Yurgelun-Todd, DA. Gender differences in cerebral blood volume after a 28-day washout period in chronic marijuana smokers [abstract]. Meeting of the International Congress on Schizophrenia Research. Whistler, British Columbia. April 2001.

29. Rohan, ML, **Killgore, WDS,** Eskesen, JG, Renshaw, PF, & Yurgelun-Todd, DA. Match-warped EPI anatomic images and the amygdala: Imaging in hard places. Proceedings of the International Society for Magnetic Resonance in Medicine, 2001; 9: 1237.

30. **Killgore, WDS** & Yurgelun-Todd, DA. Developmental changes in the lateralized activation of the prefrontal cortex and amygdala during the processing of facial affect [Abstract]. Oral platform paper presented at the 30th Annual Meeting of the International Neuropsychological Society, Toronto, Ontario, Canada, February 13-16, 2002.

31. Yurgelun-Todd, DA. & **Killgore, WDS.** Gray and white matter volume during adolescence correlates with cognitive performance: A morphometric MRI study [Abstract]. Oral platform paper presented at the 30th Annual Meeting of the International Neuropsychological Society, Toronto, Ontario, Canada, February 13-16, 2002.

32. **Killgore, WDS,** Reichardt, R. Kautz, M, Belenky, G, Balkin, T, & Wesensten, N. Daytime melatonin-zolpidem cocktail: III. Effects on salivary melatonin and performance [abstract]. Poster presented at the 17th Annual Meeting of the Associated Professional Sleep Societies, Chicago, Illinois, June 3-8, 2003.

33. **Killgore, WDS,** Young, AD, Femia, LA, Bogorodzki, P, Rogowska, J, & Yurgelun-Todd, DA. Cortical and limbic activation during viewing of high- versus low-calorie foods [abstract]. Poster Presented at the Organization for Human Brain Mapping Annual Meeting, New York, NY, June 18-22, 2003.

34. **Killgore, WDS,** & Yurgelun-Todd, DA. Amygdala activation during masked presentations of sad and happy faces [abstract]. Poster presented at the Organization for Human Brain Mapping Annual Meeting, New York, NY, June 18-22, 2003.

35. **Killgore, WDS,** Stetz, MC, Castro, CA, & Hoge, CW. Somatic and emotional stress symptom expression prior to deployment by soldiers with and without previous combat experience [abstract]. Poster presented at the 6th Annual Force Health Protection Conference, Albuquerque, NM, August, 11-17, 2003. ***[*Best Paper Award]***

36. Wesensten, NJ, Balkin, TJ, Thorne, D, **Killgore, WDS,** Reichardt, R, & Belenky, G. Caffeine, dextroamphetamine, and modafinil during 85 hours of sleep deprivation: I. Performance and alertness effects [abstract]. Poster presented at the 75th Annual Meeting of the Aerospace Medical Association, Anchorage, AK, May 2-6 2004.

37. **Killgore, WDS,** Braun, AR, Belenky, G, Wesensten, NJ, & Balkin, TJ. Regional cerebral metabolic correlates of electroencephalographic activity during stage-2 and slow-wave sleep: An H215O PET Study [abstract]. Oral platform presentation at the 18th Associated Professional Sleep Societies Annual Meeting, Philadelphia, PA, June 5-10, 2004.

38. **Killgore, WDS,** Arora, NS, Braun, AR, Belenky, G, Wesensten, NJ, & Balkin, TJ. Sleep strengthens the effective connectivity among cortical and subcortical regions: Evidence for the restorative effects of sleep using H215O PET [abstract]. Poster presented at the 17th Congress of the European Sleep Research Society, Prague, Czech Republic, October 5-9, 2004.

39. **Killgore, WDS,** Arora, NS, Braun, AR, Belenky, G, Wesensten, NJ, & Balkin, TJ An H215O PET study of regional cerebral activation during stage 2 sleep [abstract]. Poster presented at the 17th Congress of the European Sleep Research Society, Prague, Czech

Republic, October 5-9, 2004.

40. Wesensten, N, **Killgore, WDS,** Belenky, G, Reichardt, R, Thorne, D, & Balkin, T. Caffeine, dextroamphetamine, and modafinil during 85 H of sleep deprivation. II. Effects of tasks of executive function [abstract]. Poster presented at the 17th Congress of the European Sleep Research Society, Prague, Czech Republic, October 5-9, 2004.

41. Balkin, T, Reichardt, R, Thorne, D, **Killgore, WDS,** Belenky, G, & Wesensten, N. Caffeine, dextroamphetamine, and modafinil during 85 hours of sleep deprivation. I. Psychomotor vigilance and objective alertness effects [abstract]. Oral paper presentation at the 17th Congress of the European Sleep Research Society, Prague, Czech Republic, October 5-9, 2004.

42. Belenky, G, Reichardt, R, Thorne, D, **Killgore, WDS,** Balkin, T, & Wesensten, N. Caffeine, dextroamphetamine, and modafinil during 85 hours of sleep deprivation. III. Effect on recovery sleep and post-recovery sleep performance [abstract]. Oral paper presentation at the 17th Congress of the European Sleep Research Society, Prague, Czech Republic, October 5-9, 2004.

43. Vo, A, Green, J, Campbell, W, **Killgore, WDS,** Labutta, R, & Redmond, D. The quantification of disrupted sleep in migraine via actigraphy: A pilot study [abstract]. Abstract presented at the Associated Professional Sleep Societies 19th Annual Meeting, Denver, CO, June 18-23, 2005. SLEEP, 28 (Supplement), A281.

44. Kendall, AP, **Killgore, WDS,** Kautz, M, & Russo, MB. Left-visual field deficits in attentional processing after 40 hours of sleep deprivation [abstract]. Abstract presented at the Associated Professional Sleep Societies 19th Annual Meeting, Denver, CO, June 18-23, 2005. SLEEP, 28 (Supplement), A143.

45. Reichardt, RM, Grugle, NL, Balkin, TJ, & **Killgore, WDS.** Stimulant countermeasures, risk propensity, and IQ across 2 nights of sleep deprivation [abstract]. Abstract presented at the Associated Professional Sleep Societies 19th Annual Meeting, Denver, CO, June 18-23, 2005. SLEEP, 28 (Supplement), A145.

46. Killgore, DB, McBride, SA, Balkin, TJ, & **Killgore, WDS.** Post-stimulant hangover: The effects of caffeine, modafinil, and dextroamphetamine on sustained verbal fluency following sleep deprivation and recovery sleep [abstract]. Abstract presented at the Associated Professional Sleep Societies 19th Annual Meeting, Denver, CO, June 18-23, 2005. SLEEP, 28 (Supplement), A137.

47. **Killgore, WDS,** Balkin, TJ, & Wesensten, NJ. Impaired decision-making following 49 hours of sleep deprivation [abstract]. Abstract presented at the Associated Professional Sleep Societies 19th Annual Meeting, Denver, CO, June 18-23, 2005. SLEEP, 28 (Supplement), A138.

48. **Killgore, WDS,** McBride, SA, Killgore, DB, & Balkin, TJ. Stimulant countermeasures and risk propensity across 2 nights of sleep deprivation [abstract]. Abstract presented at the Associated Professional Sleep Societies 19th Annual Meeting, Denver, CO, June 18-23, 2005.

SLEEP, 28 (Supplement), A136.

49. McBride, SA, Balkin, TJ, & **Killgore, WDS.** The effects of 24 hours of sleep deprivation on odor identification accuracy [abstract]. Abstract presented at the Associated Professional Sleep Societies 19th Annual Meeting, Denver, CO, June 18-23, 2005. SLEEP, 28 (Supplement), A137.

50. Picchioni, D, **Killgore, WDS,** Braun, AR, & Balkin, TJ. PET correlates of EEG activity during non-REM sleep. Poster presentation at the annual UCLA/Websciences Sleep Training Workshop, Lake Arrowhead, CA, September, 2005.

51. **Killgore, WDS,** Killgore, DB, McBride, SA, & Balkin, TJ. Sustained verbal fluency following sleep deprivation and recovery sleep: The effects of caffeine, modafinil, and dextroamphetamine. Poster presented at the 34th Meeting of the International Neuropsychological Society, Boston, MA, February 1-4, 2006.

52. **Killgore, WDS,** Balkin, TJ, & Wesensten, NJ. Decision-making is impaired following 2-days of sleep deprivation. Poster presented at the 34th Meeting of the International Neuropsychological Society, Boston, MA, February 1-4, 2006.

53. **Killgore, WDS,** & Yurgelun-Todd, DA. Neural correlates of emotional intelligence in adolescent children. Poster presented at the 34th Meeting of the International Neuropsychological Society, Boston, MA, February 1-4, 2006.

54. **Killgore, WDS,** & Yurgelun-Todd, DA. Social anxiety predicts amygdala activation in adolescents viewing fearful faces. Poster presented at the 34th Meeting of the International Neuropsychological Society, Boston, MA, February 1-4, 2006.

55. McBride, SA & **Killgore, WDS.** Sleepy people smell worse: Olfactory deficits following extended wakefulness. Paper presented at the Workshop on Trace Gas Detection Using Artificial, Biological, and Computational Olfaction. Monell Chemical Senses Center, Philadelphia, PA, March 29-31, 2006.

56. **Killgore, WDS,** Day LM, Li, C, Kamimori, GH, Balkin, TJ, & Killgore DB. Moral reasoning is affected by sleep deprivation [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A137.

57. **Killgore, WDS,** Killgore DB, Kahn-Green, E, Conrad, A, Balkin, TJ, & Kamimori, G. H. Introversion-Extroversion predicts resilience to sleep loss [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A137.

58. Newman, R, Kamimori, GH, **Killgore, WDS.** Sleep deprivation diminishes constructive thinking [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A136-137.

59. Huck, NO, Kendall, AP, McBride, SA, **Killgore, WDS.** The perception of facial emotion is

enhanced by psychostimulants following two nights of sleep deprivation [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A136.

60. O'Sullivan, M, Reichardt, RM, Krugler, AL, Killgore, DB, & **Killgore, WDS.** Premorbid intelligence correlates with duration and quality of recovery sleep following sleep deprivation [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A372.

61. McBride, SA, **Killgore, WDS,** Kahn-Green, E, Conrad, A, & Kamimori, GH. Caffeine administered to maintain overnight alertness does not disrupt performance during the daytime withdrawal period [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A136.

62. McBride, SA, Killgore DB, Balkin, TJ, Kamimori, GH, & **Killgore, WDS.** Sleepy people smell worse: Olfactory decrements as a function of sleep deprivation [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A135.

63. Day, LM, Li, C, Killgore, DB, Kamimori, GH, & **Killgore, WDS.** Emotional intelligence moderates the effect of sleep deprivation on moral reasoning [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A135.

64. Murray, CJ, Killgore, DB, Kamimori, GH, & **Killgore, WDS.** Individual differences in stress management capacity predict responsiveness to caffeine during sleep deprivation [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A43.

65. Murray, CJ, Newman, R, O'Sullivan, M, Killgore, DB, Balkin, TJ, & **Killgore, WDS.** Caffeine, dextroamphetamine, and modafinil fail to restore Stroop performance during sleep deprivation [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A370-371.

66. Richards, J, Killgore, DB, & **Killgore, WDS.** The effect of 44 hours of sleep deprivation on mood using the Visual Analog Mood Scales [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A132.

67. Richards, J, & **Killgore, WDS.** The effect of caffeine, dextroamphetamine, and modafinil on alertness and mood during sleep deprivation [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A43.

68. Lipizzi, EL, Leavitt, BP, Killgore, DB, Kamimori, GH, & **Killgore, WDS.** Decision making capabilities decline with increasing duration of wakefulness [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-

22, 2006. SLEEP, 29 (Supplement), A131.

69. Lipizzi, EL, Killgore, DB, Kahn-Green, E, Kamimori, GH, & **Killgore, WDS.** Emotional intelligence scores decline during sleep deprivation [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A131.

70. Kahn-Green, E, Day, L, Conrad, A, Leavitt, BP, Killgore, DB, & **Killgore, WDS.** Short-term vs. long-term planning abilities: Differential effects of stimulants on executive function in sleep deprived individuals [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A370.

71. Kahn-Green, E, Conrad, A, Killgore, DB, Kamimori, GH, & **Killgore, WDS.** Tired and frustrated: Using a projective technique for assessing responses to stress during sleep deprivation [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A130.

72. Killgore, DB, Kahn-Green, E, Balkin, TJ, Kamimori, GH, & **Killgore, WDS.** 56 hours of wakefulness is associated with a sub-clinical increase in symptoms of psychopathology [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A130.

73. Killgore, DB, McBride, SA, Balkin, TJ, Leavitt, BP, & **Killgore, WDS.** Modafinil improves humor appreciation during sleep deprivation [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A42.

74. Reichardt, RM, Killgore, DB, Lipizzi, EL, Li, CJ, Krugler, AL, & **Killgore, WDS.** The effects of stimulants on recovery sleep and post-recovery verbal performance following 61-hours of sleep deprivation [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A42.

75. Bailey, JD, Richards, J, & **Killgore, WDS.** Prediction of mood fluctuations during sleep deprivation with the SAFTE Model [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A60.

76. Kendall, AP, McBride, S. A, & **Killgore, WDS.** Visuospatial perception of line orientation is resistant to one night of sleep loss [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A369.

77. Kendall, AP, McBride, SA, Kamimori, GH, & **Killgore, WDS.** The interaction of coping skills and stimulants on sustaining vigilance: Poor coping may keep yoiu up at night [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A129.

78. Muckle, A, Killgore, DB, & **Killgore, WDS.** Gender differences in the effects of stimulant medications on the ability to estimate unknown quantities when sleep deprived [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A369.

79. Krugler, AL, **Killgore, WDS,** & Kamimori, G. H. Trait anger predicts resistance to sleep loss [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A129.

80. **Killgore, WDS,** Cotting, DI, Vo, A. H, Castro, CA, & Hoge, CW. The invincibility syndrome: Combat experiences predict risk-taking propensity following redeployment [abstract]. Abstract presented at the 9th Annual Force Health Protection Conference, Albuquerque, NM, August 6-11, 2006.

81. **Killgore, WDS,** Wesensten, NJ, & Balkin, TJ. Stimulants improve tactical but not strategic planning during prolonged wakefulness [abstract]. Abstract presented at the 9th Annual Force Health Protection Conference, Albuquerque, NM, August 6-11, 2006.

82. **Killgore, WDS,** Balkin, TJ, Wesensten, NJ, & Kamimori, G. H. The effects of sleep loss and caffeine on decision-making [abstract]. Abstract presented at the 9th Annual Force Health Protection Conference, Albuquerque, NM, August 6-11, 2006.

83. **Killgore, WDS,** Balkin, TJ, & Kamimori, GH. Sleep loss can impair moral judgment [abstract]. Abstract presented at the 9th Annual Force Health Protection Conference, Albuquerque, NM, August 6-11, 2006.

84. **Killgore, WDS,** Lipizzi, EL, Reichardt, RM, Kamimori, GH, & Balkin, TJ. Can stimulants reverse the effects of sleep deprivation on risky decision-making [abstract]? Abstract presented at the 25th Army Science Conference, Orlando, FL, November 27-30, 2006.

85. **Killgore, WDS,** Killgore, DB, Kamimori, GH, & Balkin, TJ. Sleep deprivation impairs the emotional intelligence and moral judgment capacities of Soldiers [abstract]. Abstract presented at the 25th Army Science Conference, Orlando, FL, November 27-30, 2006.

86. **Killgore, WDS,** Cotting, DI, Vo, AH, Castro, C.A, & Hoge, CW. The post-combat invincibility syndrome: Combat experiences increase risk-taking propensity following deployment [abstract]. Abstract presented at the 25th Army Science Conference, Orlando, FL, November 27-30, 2006.

87. Adam, GE, Szelenyi, ER, **Killgore, WD,** & Lieberman, HR. A double-blind study of two days of caloric deprivation: Effects on judgment and decision-making. Oral paper presentation at the Annual Scientific Meeting of the Aerospace Medical Association, New Orleans, LA, May, 2007.

88. Killgore, DB, Kahn-Greene, ET, Kamimori, GH, & **Killgore, WD.** The effects of acute caffeine withdrawal on short category test performance in sleep deprived individuals [abstract]. Abstract presented at the 21st Meeting of the Associated Professional Sleep

Societies, Minneapolis, MN, June 9-14, 2007. SLEEP, 30 (Supplement), A43.

89. Richards, JM, Lipizzi, EL, Kamimori, GH, & **Killgore, WD.** Extroversion predicts change in attentional lapses during sleep deprivation [abstract]. Abstract presented at the 21st Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 9-14, 2007. SLEEP, 30 (Supplement), A137.

90. Lipizzi, EL, Richards, JM, Balkin, TJ, Grugle, NL, & **Killgore, WD.** Morningness-Eveningness and Intelligence [abstract]. Abstract presented at the 21st Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 9-14, 2007. SLEEP, 30 (Supplement), A345.

91. Lipizzi, EL, Richards, Balkin, TJ, Grugle, NL, & **Killgore WD.** Morningness-Eveningness affects risk-taking propensity during sleep deprivation [abstract]. Abstract presented at the 21st Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 9-14, 2007. SLEEP, 30 (Supplement), A136.

92. McBride, SA, Ganesan, G, Kamimori, GH, & **Killgore, WD.** Odor identification ability predicts vulnerability to attentional lapses during 77 hours of sleep deprivation [abstract]. Abstract presented at the 21st Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 9-14, 2007. SLEEP, 30 (Supplement), A135.

93. Smith, KL, McBride, S. A, Kamimori, GH, & **Killgore, WD.** Individual differences in odor discrimination predict mood dysregulation following 56 hours of sleep deprivation [abstract]. Abstract presented at the 21st Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 9-14, 2007. SLEEP, 30 (Supplement), A136.

94. McBride, SA, Leavitt, BP, Kamimori, GH, & **Killgore, WD.** Odor identification accuracy predicts resistance to sleep loss. Abstract presented at the 21st Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 9-14, 2007. SLEEP, 30 (Supplement), A137.

95. Killgore, DB, McBride, SA, Balkin, TJ, Grugle, NL. & **Killgore, WD.** Changes in odor discrimination predict executive function deficits following 45 hours of wakefulness [abstract]. Abstract presented at the 21st Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 9-14, 2007. SLEEP, 30 (Supplement), A136.

96. Rupp, TL, Killgore, DB, Balkin, TJ, Grugle, NL, & **Killgore, WD.** The effects of modafinil, dextroamphetamine, and caffeine on verbal and nonverbal fluency in sleep deprived individuals [abstract]. Abstract presented at the 21st Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 9-14, 2007. SLEEP, 30 (Supplement), A43.

97. Newman, RA, Krugler, AL, Kamimori, GH, & **Killgore, WD.** Changes in state and trait anger following 56 hours of sleep deprivation [abstract]. Abstract presented at the 21st Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 9-14, 2007. SLEEP, 30 (Supplement), A138.

98. Rupp, TL, Grugle, NL, Krugler, AL, Balkin, TJ, & **Killgore, WD.** Caffeine,

dextroamphetamine, and modafinil improve PVT performance after sleep deprivation and recovery sleep [abstract]. Abstract presented at the 21st Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 9-14, 2007. SLEEP, 30 (Supplement), A44.

99. **Killgore, WD,** Lipizzi, EL, Balkin, TJ, Grugle, NL, & Killgore, DB. The effects of sleep deprivation and stimulants on self-reported sensation seeking propensity [abstract]. Abstract presented at the 21st Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 9-14, 2007. SLEEP, 30 (Supplement), A42.

100. **Killgore, WD,** Richards, JM, Balkin, TJ, Grugle, NL, & Killgore DB. The effects of sleep deprivation and stimulants on risky behavior [abstract]. Abstract presented at the 21st Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 9-14, 2007. SLEEP, 30 (Supplement), A41.

101. Newman, RA, Smith, KL, Balkin, TJ, Grugle, NL, & **Killgore, WD.** The effects of caffeine, dextroamphetamine, and modafinil on executive functioning following 45 hours of sleep deprivation [abstract]. Abstract presented at the 21st Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 9-14, 2007. SLEEP, 30 (Supplement), A45.

102. Richards, JM, Lipizzi, EL, Balkin, TJ, Grugle, NL, & **Killgore, WD.** Objective alertness predicts mood changes during 44 hours of sleep deprivation [abstract]. Abstract presented at the 21st Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 9-14, 2007. SLEEP, 30 (Supplement), A56.

103. **Killgore, WD,** & Yurgelun-Todd, DA. Cortical and Limbic Activation in Response to Visual Images of Low and High-Caloric Food [abstract]. Oral symposium presented at the 6th Annual Conference of the Society of Behavioral Nutrition and Physical Activity (ISBNPA), Oslo, Norway, June 20-23, 2007. Proceedings of the ISBNPA, 2007, 75.

104. Estrada, A, **Killgore, WD,** Rouse, T, Balkin, TJ, & Wildzunas, RM. Total sleep time measured by actigraphy predicts academic performance during military training [abstract]. Abstract presented at the 22nd Meeting of the Associated Professional Sleep Societies, Baltimore, MD, June 7-12, 2008. SLEEP, 31 (Supplement), A134.

105. **Killgore, WD,** Lipizzi, EL, Smith, KL, Killgore, DB, Rupp, TL, Kamimori, GH, & Balkin, T. J. Nonverbal intelligence is inversely related to the ability to resist sleep loss [abstract]. Abstract presented at the 22nd Meeting of the Associated Professional Sleep Societies, Baltimore, MD, June 7-12, 2008. SLEEP, 31 (Supplement), A134.

106. **Killgore, WD,** Lipizzi, EL, Killgore, DB, Rupp, TL, Kamimori, GH, & Balkin, TJ. Emotional intelligence predicts declines in emotion-based decision-making following sleep deprivation [abstract]. Abstract presented at the 22nd Meeting of the Associated Professional Sleep Societies, Baltimore, MD, June 7-12, 2008. SLEEP, 31 (Supplement), A134.

107. Reid, CT, Smith, K, **Killgore, WD,** Rupp, TL, & Balkin, TJ. Higher intelligence is associated with less subjective sleepiness during sleep restriction [abstract]. Abstract presented at the 22nd Meeting of the Associated Professional Sleep Societies, Baltimore, MD,

June 7-12, 2008. SLEEP, 31 (Supplement), A375.

108. Newman, R, **Killgore, WD,** Rupp, T. L, & Balkin, TJ. Better baseline olfactory discrimination is associated with worse PVT and MWT performance with sleep restriction and recovery [abstract]. Abstract presented at the 22nd Meeting of the Associated Professional Sleep Societies, Baltimore, MD, June 7-12, 2008. SLEEP, 31 (Supplement), A375.

109. Smith, KL, Reid, CT, **Killgore, WD,** Rupp, TL, & Balkin, TJ. Personality factors associated with performance and sleepiness during sleep restriction and recovery [abstract]. Abstract presented at the 22nd Meeting of the Associated Professional Sleep Societies, Baltimore, MD, June 7-12, 2008. SLEEP, 31 (Supplement), A376.

110. Lipizzi, EL, **Killgore, WD,** Rupp, TL, & Balkin, TJ. Risk-taking behavior is elevated during recovery from sleep restriction [abstract]. Abstract presented at the 22nd Meeting of the Associated Professional Sleep Societies, Baltimore, MD, June 7-12, 2008. SLEEP, 31 (Supplement), A376.

111. Lipizzi, EL, Rupp, TL, **Killgore, WD,** & Balkin, TJ. Sleep restriction increases risk-taking behavior [abstract]. Poster presented at the 11th Annual Force Health Protection Conference, Albuquerque, NM, August, 9-15, 2008.

112. **Killgore, WD,** Estrada, A, Balkin, TJ, & Wildzunas, RM. Sleep duration during army training predicts course performance [abstract]. Poster presented at the 6th Annual Force Health Protection Conference, Albuquerque, NM, August, 11-17, 2008.

113. **Killgore, WD,** Lipizzi, EL, Smith, KL, Killgore, DB, Rupp, TL, Kamimori, GH, & Balkin, TJ. Higher cognitive ability is associated with reduced relative resistance to sleep loss [abstract]. Poster presented at the 6th Annual Force Health Protection Conference, Albuquerque, NM, August, 11-17, 2008.

114. **Killgore, WD,** Rupp, TL, Grugle, NL, Lipizzi, EL, & Balkin, TJ. Maintaining alertness during sustained operations: Which stimulant is most effective after 44 hours without sleep [abstract]? Poster presented at the 6th Annual Force Health Protection Conference, Albuquerque, NM, August, 11-17, 2008.

115. **Killgore, WD,** Newman, RA, Lipizzi, EL, Kamimori, GH, & Balkin, TJ. Sleep deprivation increases feelings of anger but reduces verbal and physical aggression in Soldiers [abstract]. Poster presented at the 6th Annual Force Health Protection Conference, Albuquerque, NM, August, 11-17, 2008.

116. Kelley, AM, Dretsch, M, **Killgore, WD,** & Athy, JR. Risky behaviors and attitudes about risk in Soldiers. Abstract presented at the 29th Annual Meeting of the Society for Judgment and Decision Making, Chicago, IL, November, 2008.

117. **Killgore, WD,** Ross, AJ, Silveri, MM, Gruber, SA, Kamiya, T, Kawada, Y, Renshaw, PF, & Yurgelun-Todd, DA. Citicoline affects appetite and cortico-limbic responses to images of high calorie foods. Abstract presented at the Society for Neuroscience, Washington DC,

November 19, 2008.

118. Britton, JC, Stewart, SE, Price, LM, **Killgore, WD,** Gold, AL, Jenike, MA, & Rauch, SL. Reduced amygdalar activation in response to emotional faces in pediatric Obsessive-Compulsive Disorder. Abstract presented at the Annual meeting of the American College of Neuropsychopharmacology, Scottsdale, AZ, December 7-11, 2008.

119. **Killgore, WD,** Balkin, TJ, Estrada, A, & Wildzunas, RM. Sleep and performance measures in soldiers undergoing military relevant training. Abstract presented at the 26th Army Science Conference, Orlando, FL, December 1-4, 2008.

120. **Killgore, WD** & Yurgelun-Todd, DA. Cerebral correlates of amygdala responses during non-conscious perception of affective faces in adolescent children. Abstract presented at the 37th Annual Meeting of the International Neuropsychological Society, Atlanta, GA, February 11-14, 2009.

121. **Killgore, WD,** Killgore, DB, Grugle, NL, & Balkin, TJ. Odor identification ability predicts executive function deficits following sleep deprivation. Abstract presented the 37th Annual Meeting of the International Neuropsychological Society, Atlanta, GA, February 11-14, 2009.

122. **Killgore, WD,** Rupp, TL, Killgore, DB, Grugle, NL, and Balkin, TJ. Differential effects of stimulant medications on verbal and nonverbal fluency during sleep deprivation. Abstract presented the 37th Annual Meeting of the International Neuropsychological Society, Atlanta, GA, February 11-14, 2009.

123. **Killgore, WD,** Killgore, DB, Kamimori, GH, & Balkin, TJ. When being smart is a liability: More intelligent individuals may be less resistant to sleep deprivation. Abstract presented the 37th Annual Meeting of the International Neuropsychological Society, Atlanta, GA, February 11-14, 2009.

124. **Killgore, WD,** Britton, JC, Price, LM, Gold, AL, Deckersbach, T, & Rauch, SL. Introversion is associated with greater amygdala and insula activation during viewing of masked affective stimuli. Abstract presented the 37th Annual Meeting of the International Neuropsychological Society, Atlanta, GA, February 11-14, 2009.

125. **Killgore, WD,** Britton, JC, Price, LM, Gold, AL, Deckersbach, T, & Rauch, SL. Amygdala responses of specific animal phobics do not differ from healthy controls during masked fearful face perception. Abstract presented the 37th Annual Meeting of the International Neuropsychological Society, Atlanta, GA, February 11-14, 2009.

126. **Killgore, WD,** Britton, JC, Price, LM, Gold, AL, Deckersbach, T, & Rauch, SL. Small animal phobics show sustained amygdala activation in response to masked happy facial expressions. Abstract presented the 37th Annual Meeting of the International Neuropsychological Society, Atlanta, GA, February 11-14, 2009. ***[*Merit Poster Award]***

127. Price, LM, **Killgore, WD,** Britton, JC, Kaufman, ML, Gold, AL, Deckersbach, T, & Rauch, SL. Anxiety sensitivity correlates with insula activation in response to masked fearful faces in specific animal phobics and healthy subjects. Abstract presented at the Annual Conference

of the Anxiety Disorders Association of America, Santa Ana Pueblo, New Mexico, March 12-15, 2009.

128. **Killgore, WD,** Britton, JC, Price, LM, Gold, AL, Deckersbach, T, & Rauch, SL. Neuroticism is inversely correlated with amygdala and insula activation during masked presentations of affective stimuli. Abstract presented at the Annual Conference of the Anxiety Disorders Association of America, Santa Ana Pueblo, New Mexico, March 12-15, 2009.

129. **Killgore, WD,** Kelley, AM, & Balkin, TJ. Development and validation of a scale to measure the perception of invincibility. Abstract presented at the Annual Conference of the Anxiety Disorders Association of America, Santa Ana Pueblo, New Mexico, March 12-15, 2009.

130. Kelly, AM, **Killgore WD,** Athy, J, & Dretsch, M. Risk propensity, risk perception, risk aversion, and sensation seeking in U.S. Army soldiers. Abstract presented at the 80th Annual Scientific Meeting of the Aerospace Medical Association, Los Angeles, CA, May 3-7, 2009.

131. Britton, JC, Stewart, SE, Price, LM, **Killgore, WD,** Jenike, MA, & Rauch, SL. The neural correlates of negative priming in pediatric obsessive-compulsive disorder (OCD). Abstract presented at the 64th Annual Scientific Meeting of the Society of Biological Psychiatry, Vancouver, Canada, May 14-16, 2009.

132. **Killgore, WD,** Killgore, DB, Kamimori, GH, & Balkin, TJ. Caffeine protects against increased risk-taking behavior during severe sleep deprivation. Abstract presented at the 23rd Annual Meeting of the Associated Professional Sleep Societies, Seattle, Washington, June 7-12, 2009.

133. Killgore, DB, **Killgore, WD,** Grugle, NL, & Balkin, TJ. Executive functions predict the ability to sustain psychomotor vigilance during sleep loss. Abstract presented at the 23rd Annual Meeting of the Associated Professional Sleep Societies, Seattle, Washington, June 7-12, 2009.

134. **Killgore, WD,** & Yurgelun-Todd, DA. Trouble falling asleep is associated with reduced activation of dorsolateral prefrontal cortex during a simple attention task. Abstract presented at the 23rd Annual Meeting of the Associated Professional Sleep Societies, Seattle, Washington, June 7-12, 2009.

135. **Killgore, WD,** Kelley, AM, & Balkin, TJ. A new scale for measuring the perception of invincibility. Abstract presented at the 12th Annual Force Health Protection Conference, Albuquerque, New Mexico, August 14-21, 2009.

136. **Killgore, WD,** Killgore, DB, Grugle, NL, & Balkin, TJ. Executive functions contribute to the ability to resist sleep loss. Abstract presented at the 12th Annual Force Health Protection Conference, Albuquerque, New Mexico, August 14-21, 2009.

137. **Killgore, WD,** Killgore, DB, Kamimori, GH, & Balkin, TJ. Caffeine reduces risk-taking behavior during severe sleep deprivation. Abstract presented at the 12th Annual Force Health Protection Conference, Albuquerque, New Mexico, August 14-21, 2009. ***[*Best Paper: Research]***

138. **Killgore, WD,** Castro, CA, & Hoge, CW. Normative data for the Evaluation of Risks Scale—Bubble Sheet Version (EVAR-B) for large scale surveys of returning combat veterans. Abstract presented at the 12th Annual Force Health Protection Conference, Albuquerque, New Mexico, August 14-21, 2009.

139. **Killgore, WD,** Castro, CA, & Hoge, CW. Combat exposure and post-deployment risky behavior. Abstract presented at the 12th Annual Force Health Protection Conference, Albuquerque, New Mexico, August 14-21, 2009.

140. **Killgore, WD**, Price, LM, Britton, JC, Simon, N, Pollack, MH, Weiner, MR, Schwab, ZJ, Rosso, IM, & Rauch, SL. Paralimbic responses to masked emotional faces in PTSD: Disorder and valence specificity. Abstract presented at the Annual McLean Hospital Research Day, January 29, 2010.

141. **Killgore, WD**, Killgore, DB, Kamimori, GH, & Balkin, TJ. Caffeine minimizes behavioral risk-taking during 75 hours of sleep deprivation. Abstract presented at the 38th Annual Meeting of the International Neuropsychological Society, Acapulco, Mexico, February 3-6, 2010.

142. **Killgore, WD** & Balkin, TJ. Vulnerability to sleep loss is affected by baseline executive function capacity. Abstract presented at the 38th Annual Meeting of the International Neuropsychological Society, Acapulco, Mexico, February 3-6, 2010.

143. **Killgore, WD**, Smith, KL, Reichardt, RM., Killgore, DB, & Balkin, TJ. Intellectual capacity is related to REM sleep following sleep deprivation. Abstract presented at the 38th Annual Meeting of the International Neuropsychological Society, Acapulco, Mexico, February 3-6, 2010.

144. **Killgore, WD** & Yurgelun-Todd, DA. Cerebral correlates of amygdala responses to masked fear, anger, and happiness in adolescent and pre-adolescent children. Abstract presented at the 38th Annual Meeting of the International Neuropsychological Society, Acapulco, Mexico, February 3-6, 2010.

145. **Killgore, WD**, Post, A, & Yurgelun-Todd, DA. Sex differences in cortico-limbic responses to images of high calorie food. Abstract presented at the 38th Annual Meeting of the International Neuropsychological Society, Acapulco, Mexico, February 3-6, 2010.

146. **Killgore, WD** & Yurgelun-Todd, DA. Self-reported insomnia is associated with increased activation within the default-mode network during a simple attention task. Abstract presented at the 38th Annual Meeting of the International Neuropsychological Society, Acapulco, Mexico, February 3-6, 2010.

147. **Killgore, WD**, Price, LM, Britton, JC, Gold, AL, Deckersbach, T, & Rauch, SL. Neural correlates of anxiety sensitivity factors during presentation of masked fearful faces. Abstract presented at the 38th Annual Meeting of the International Neuropsychological Society, Acapulco, Mexico, February 3-6, 2010.

148. **Killgore, WD**, Grugle, NL, Conrad, TA, & Balkin, TJ. Baseline executive function abilities predict risky behavior following sleep deprivation. Abstract presented at the 24th Annual Meeting of the Associated Professional Sleep Societies, San Antonio, Texas, June 5-9, 2010.

149. **Killgore, WD**, Grugle, NL, & Balkin, TJ. Judgment of objective vigilance performance is affected by sleep deprivation and stimulants. Abstract presented at the 24th Annual Meeting of the Associated Professional Sleep Societies, San Antonio, Texas, June 5-9, 2010.

150. Killgore, DB, **Killgore, WD**, Grugle, NL, & Balkin, TJ. Resistance to sleep loss and its relationship to decision making during sleep deprivation. Abstract presented at the 24th Annual Meeting of the Associated Professional Sleep Societies, San Antonio, Texas, June 5-9, 2010.

151. Killgore DB, **Killgore, WD**, Grugle, NL, & Balkin, TJ. Subjective sleepiness and objective performance: Differential effects of stimulants during sleep deprivation. Abstract presented at the 24th Annual Meeting of the Associated Professional Sleep Societies, San Antonio, Texas, June 5-9, 2010.

152. Rupp, TL, **Killgore, WD**, & Balkin, TJ. Vulnerability to sleep deprivation is differentially mediated by social exposure in extraverts vs. introverts. Oral presentation at the "Data Blitz" section at the 24th Annual Meeting of the Associated Professional Sleep Societies, San Antonio, Texas, June 5-9, 2010.

153. Rupp, TL, **Killgore, WD**, & Balkin, TJ. Extraverts may be more vulnerable than introverts to sleep deprivation on some measures of risk-taking and executive functioning. Abstract presented at the 24th Annual Meeting of the Associated Professional Sleep Societies, San Antonio, Texas, June 5-9, 2010.

154. Rupp, TL, **Killgore, WD**, & Balkin, TJ. Vulnerability to sleep deprivation is differentially mediated by social exposure in extraverts vs. introverts. Abstract presented at the 24th Annual Meeting of the Associated Professional Sleep Societies, San Antonio, Texas, June 5-9, 2010.

155. Capaldi, VF, Guerrero, ML, & **Killgore, WD**. Sleep disorders among OIF and OEF Soldiers. Abstract presented at the 24th Annual Meeting of the Associated Professional Sleep Societies, San Antonio, Texas, June 5-9, 2010.

156. **Killgore, WD**, Killgore, DB, Kamimori, GH, & Balkin, TJ. Caffeine reduces behavioral risk-taking during sleep deprivation. Abstract presented at the 65th Annual Meeting of the Society for Biological Psychiatry, New Orleans, Louisiana, May 20-22, 2010.

157. **Killgore, WD**, Price, LM, Britton, JC, Simon, N, Pollack, MH, Weiner, MR, Schwab, ZJ, Rosso, IM, & Rauch, SL. Paralimbic responses to masked emotional faces in PTSD: Disorder and valence specificity. Abstract presented at the 65th Annual Meeting of the Society for Biological Psychiatry, New Orleans, Louisiana, May 20-22, 2010.

158. Rosso, IM, Makris, N, Britton, JC, Price, LM, Gold, AL, Deckersbach, T, **Killgore, WD**, & Rauch SL. Anxiety sensitivity correlates with insular cortex volume and thickness in specific

animal phobia. Abstract presented at the 65th Annual Meeting of the Society for Biological Psychiatry, New Orleans, Louisiana, May 20-22, 2010.

159. Rupp, TL, **Killgore, WD**, & Balkin, TJ. Vulnerability to sleep deprivation is mediated by social exposure in extraverts versus introverts. Oral platform presentation at the 20th Congress of the European Sleep Research Society, Lisbon, Portugal, September 14-18, 2010.

160. **Killgore, WD**, Estrada, A, & Balkin, TJ. A tool for monitoring soldier fatigue and predicting cognitive readiness: The Sleep History and Readiness Predictor (SHARP). Abstract presented at the 27th Army Science Conference, Orlando, FL, November 29-December 2, 2010.

161. **Killgore, WD**, Kamimori, GH, & Balkin, TJ. Caffeinated gum minimizes risk-taking in soldiers during prolonged sleep deprivation. Abstract presented at the 27th Army Science Conference, Orlando, FL, November 29-December 2, 2010.

162. **Killgore, WD**, Britton, JC, Schwab, ZJ, Weiner, MR, Rosso, IM, & Rauch, SL. Exaggerated amygdala responses to masked fearful faces are specific to PTSD versus simple phobia. Oral platform presentation at the 27th Army Science Conference, Orlando, FL, November 29-December 2, 2010. ***[*Winner Best Paper in Neuroscience]***

163. **Killgore, WD**, Kamimori, GH, & Balkin, TJ. Sleep deprivation selectively impairs emotional aspects of cognitive functioning. Oral platform presentation at the 27th Army Science Conference, Orlando, FL, November 29-December 2, 2010.

164. Rupp, TL, **Killgore, WD**, & Balkin, TJ. Evaluation of personality and social exposure as individual difference factors influencing response to sleep deprivation. Oral platform presentation at the 27th Army Science Conference, Orlando, FL, November 29-December 2, 2010.

165. **Killgore, WD**, Britton, JC, Rosso, IM, Schwab, ZJ, Weiner, MR, & Rauch, SL. Shared and differential patterns of amygdalo-cortical activation across anxiety disorders. Abstract presented at the 49th Annual Meeting of the American College of Neuropsychopharmacology, Miami Beach, FL, December 5-9, 2010.

166. Rosso, IM, **Killgore, WD**, Britton, JC, Weiner, MR, Schwab, ZJ, & Rauch, SL. Neural correlates of PTSD symptom dimensions during emotional processing: A functional magnetic resonance imaging study. Abstract presented at the 49th Annual Meeting of the American College of Neuropsychopharmacology, Miami Beach, FL, December 5-9, 2010.

167. **Killgore, WD,** Rosso, IM, Britton, JC, Schwab, ZJ, Weiner, MR, & Rauch, SL. Cortico-limbic activation differentiates among anxiety disorders with and without a generalized threat response. Abstract presented at the McLean Hospital Research Day, January 13, 2011.

168. Weiner, MR, Schwab, ZJ, Rauch, SL, & **Killgore WD**. Personality factors predict brain responses to images of high-calorie foods. Abstract presented at the McLean Hospital Research Day, January 13, 2011.

169. Schwab, ZJ, Weiner, MR, Rauch, SL, & **Killgore, WD.** Emotional and cognitive

intelligence: Support for the neural efficiency hypothesis. Abstract presented at the McLean Hospital Research Day, January 13, 2011.

170. Crowley, DJ, Covell, MJ, **Killgore, WD**, Schwab, ZJ, Weiner, MR, Acharya, D, Rosso, IM, & Silveri, MM. Differential influence of facial expression on inhibitory capacity in adolescents versus adults. Abstract presented at the McLean Hospital Research Day, January 13, 2011.

171. **Killgore, WD**, Britton, JC, Rosso, IM, Schwab, ZJ, Weiner, MR, & Rauch, SL. Similarities and differences in cortico-limbic responses to masked affect probes across anxiety disorders. Abstract presented at the 39th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 2-5, 2011.

172. Rosso, IM, **Killgore, WD**, Britton, JC, Weiner, MR, Schwab, ZJ, & Rauch, SL. Hyperarousal and reexperiencing symptoms of post-traumatic stress disorder are differentially associated with limbic-prefrontal brain responses to threatening stimuli. Abstract presented at the 39th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 2-5, 2011.

173. Schwab, ZJ, Weiner, MR, Rauch, SL, & **Killgore, WD**. Neural correlates of cognitive and emotional intelligence in adults. Abstract presented at the 39th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 2-5, 2011.

174. Schwab, ZJ, Weiner, MR, Rauch, SL, & **Killgore, WD**. Cognitive and emotional intelligences: Are they distinct or related constructs? Abstract presented at the 39th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 2-5, 2011.

175. Schwab, ZJ, Weiner, MR, Rauch, SL, & **Killgore, WD**. Discrepancy scores between cognitive and emotional intelligence predict neural responses to affective stimuli. Abstract presented at the 39th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 2-5, 2011.

176. **Killgore, WD**, Schwab, ZJ, Weiner, MR, & Rauch, SL. Smart people go with their gut: Emotional intelligence correlates with non-conscious insular responses to facial trustworthiness. Abstract presented at the 39th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 2-5, 2011.

177. **Killgore, WD**, Weiner, MR, Schwab, ZJ, & Rauch, SL. Whom can you trust? Neural correlates of subliminal perception of facial trustworthiness. Abstract presented at the 39th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 2-5, 2011.

178. Weiner, MR, Schwab, ZJ, & Rauch, SL, **Killgore, WD**. Impulsiveness predicts responses of brain reward circuitry to high-calorie foods. Abstract presented at the 39th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 2-5, 2011.

179. Weiner, MR, Schwab, ZJ, & Rauch, SL, **Killgore, WD**. Conscientiousness predicts brain responses to images of high-calorie foods. Abstract presented at the 39th Annual Meeting of

the International Neuropsychological Society, Boston, MA, February 2-5, 2011.

180. Crowley, DJ, Covell, MJ, **Killgore, WD**, Schwab, ZJ, Weiner, MR, Acharya, D, Rosso, IM, & Silveri, MM. Differential influence of facial expression on inhibitory capacity in adolescents versus adults. Abstract presented at the 39th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 2-5, 2011.

181. Gruber, SA, Dahlgren, MK, **Killgore, WD**, Sagar, KA, & Racine, MT. Marijuana: Age of onset of use impacts executive function and brain activation. Abstract presented at the 39th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 2-5, 2011.

182. **Killgore, WD,** Conrad, TA, Grugle, NL, & Balkin, TJ. Baseline executive function abilities correlate with risky behavior following sleep deprivation. Abstract presented at the 39th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 2-5, 2011.

183. **Killgore, WD,** Grugle, NL, Killgore, DB, & Balkin, TJ. Resistance to sleep loss and decision making during sleep deprivation. Abstract presented at the 39th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 2-5, 2011.

184. **Killgore, WD,** Rosso, IM, Britton, JC, Schwab, ZJ, Weiner, MR, & Rauch, SL. Cortico-limbic activation differentiates among anxiety disorders with and without a generalized threat response. Abstract presented at the 66th Annual Meeting of the Society for Biological Psychiatry, San Francisco, CA, May 12-14, 2011. ***[*Blue Ribbon Finalist for Top Poster Award: Clinical/Translational]***

185. Schwab, ZJ, Weiner, MR, Rauch, SL, & **Killgore, WD.** Emotional and cognitive intelligence: Support for the neural efficiency hypothesis. Abstract presented at the 66th Annual Meeting of the Society for Biological Psychiatry, San Francisco, CA, May 12-14, 2011.

186. Weiner, MR, Schwab, ZJ, Rauch, SL, & **Killgore WD**. Personality factors predict brain responses to images of high-calorie foods. Abstract presented at the 66th Annual Meeting of the Society for Biological Psychiatry, San Francisco, CA, May 12-14, 2011.

187. **Killgore, WD,** Grugle, NL, & Balkin, TJ. Sleep deprivation impairs recognition of specific emotions. Abstract presented at the 25th Annual Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 11-15, 2011.

188. **Killgore, WD,** & Balkin, TJ. Does vulnerability to sleep deprivation influence the effectiveness of stimulants on psychomotor vigilance? Abstract presented at the 25th Annual Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 11-15, 2011.

189. Killgore, DB, **Killgore, WD,** Grugle, NJ, & Balkin, TJ. Sleep deprivation impairs recognition of specific emotions. Abstract presented at the 25th Annual Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 11-15, 2011.

190. Weiner, MR, Schwab, ZJ, & **Killgore, WD.** Daytime sleepiness is associated with altered brain activation during visual perception of high-calorie foods: An fMRI study. Abstract presented at the 25th Annual Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 11-15, 2011.

191. Schwab, ZJ, Weiner, MR, & **Killgore, WD.** Functional MRI correlates of morningness-eveningness during visual presentation of high calorie foods. Abstract presented at the 25th Annual Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 11-15, 2011.

192. **Killgore, WD,** Weiner, MR, & Schwab, ZJ. Daytime sleepiness affects prefrontal regulation of food intake. Abstract presented at the McLean Hospital Research Day, January 11, 2012.

193. Kipman, M, Schwab ZJ, Weiner, MR, DelDonno, S, Rauch SL, & **Killgore WD**. The insightful yet bitter comedian: The role of emotional versus cognitive intelligence in humor appreciation. Abstract presented at the McLean Hospital Research Day, January 11, 2012.

194. Weber, M, & **Killgore, WD**. Gray matter correlates of emotional intelligence. Abstract presented at the McLean Hospital Research Day, January 11, 2012.

195. Schwab, ZJ, & **Killgore, WD**. Sex differences in functional brain responses to food. Abstract presented at the McLean Hospital Research Day, January 11, 2012.

196. DelDonno, S, Schwab, ZJ, Kipman M, Rauch, SL, & **Killgore, WD**. The influence of cognitive and emotional intelligence on performance on the Iowa Gambling Task. Abstract presented at the McLean Hospital Research Day, January 11, 2012.

197. Song, CH, Kizielewicz, J, Schwab, ZJ, Weiner, MR, Rauch, SL, & **Killgore, WD**. Time is of the essence: The Design Organization Test as a valid, reliable, and brief measure of visuospatial ability. Abstract presented at the 40th Annual Meeting of the International Neuropsychological Society, Montreal, CA, February 15-18, 2012.

198. Kipman, M, Schwab, ZJ, DelDonno, S, & **Killgore, WD**. Gender differences in the contribution of cognitive and emotional intelligence to the left visual field bias for facial perception. Abstract presented at the 40th Annual Meeting of the International Neuropsychological Society, Montreal, CA, February 15-18, 2012.

199. Kipman, M., Schwab, ZJ, Weiner, MR, DelDonno, S, Rauch, SL, & **Killgore, WD**. Contributions of emotional versus cognitive intelligence in humor appreciation. Abstract presented at the 40th Annual Meeting of the International Neuropsychological Society, Montreal, CA, February 15-18, 2012.

200. Schwab, ZJ, & **Killgore, WD**. Disentangling emotional and cognitive intelligence. Abstract presented at the 40th Annual Meeting of the International Neuropsychological Society, Montreal, CA, February 15-18, 2012.

201. Schwab, ZJ, & **Killgore, WD**. Sex differences in functional brain responses to food. Abstract presented at the 40th Annual Meeting of the International Neuropsychological

Society, Montreal, CA, February 15-18, 2012.

202. DelDonno, S, Schwab, ZJ, Kipman, M, Rauch, SL, & **Killgore, WD**. The influence of cognitive and emotional intelligence on performance on the Iowa Gambling Task. Abstract presented at the 40th Annual Meeting of the International Neuropsychological Society, Montreal, CA, February 15-18, 2012.

203. **Killgore, WD**, Britton, JC, Rosso, IM, Schwab, ZJ, Weiner, MR, & Rauch, SL. Shared and unique patterns of cortico-limbic activation across anxiety disorders. Abstract presented at the 40th Annual Meeting of the International Neuropsychological Society, Montreal, CA, February 15-18, 2012.

204. **Killgore, WD**, & Balkin, TJ. Sleep deprivation degrades recognition of specific emotions. Abstract presented at the 40th Annual Meeting of the International Neuropsychological Society, Montreal, CA, February 15-18, 2012.

205. **Killgore, WD**, & Schwab, ZJ. Emotional intelligence correlates with somatic marker circuitry responses to subliminal cues of facial trustworthiness. Abstract presented at the 40th Annual Meeting of the International Neuropsychological Society, Montreal, CA, February 15-18, 2012.

206. **Killgore, WD**, & Schwab, ZJ. Trust me! Neural correlates of the ability to identify facial trustworthiness. Abstract presented at the 40th Annual Meeting of the International Neuropsychological Society, Montreal, CA, February 15-18, 2012.

207. **Killgore, WD**, Schwab, ZJ, Weiner, MR, Kipman, M, DelDonno, S, & Rauch SL. Overeating is associated with altered cortico-limbic responses to images of high calorie foods. Abstract presented at the 40th Annual Meeting of the International Neuropsychological Society, Montreal, CA, February 15-18, 2012.

208. **Killgore, WD**, Weiner, MR, & Schwab, ZJ. Daytime sleepiness affects prefrontal regulation of food intake. Abstract presented at the 40th Annual Meeting of the International Neuropsychological Society, Montreal, CA, February 15-18, 2012.

209. Weber, M, DelDonno, S, Kipman M, Schwab, ZJ, & **Killgore WD**. Grey matter correlates of self-reported sleep duration. Abstract presented at the Harvard Medical School Research Day, Boston, MA, March 28, 2012.

210. **Killgore, WD**. Overlapping and distinct patterns of neurocircuitry across PTSD, Panic Disorder, and Simple Phobia. Abstract presented at the 32nd Annual Conference of the Anxiety Disorders Association of America, Arlington, VA, April 12-15, 2012.

211. **Killgore, WD**, Britton, JC, Rosso, IM, Schwab, ZJ, & Rauch, SL. Shared and unique patterns of cortico-limbic activation across anxiety disorders. Abstract presented at the 67th Annual Meeting of the Society of Biological Psychiatry, Philadelphia, PA, May 3-5, 2012.

212. **Killgore, WD**, Schwab, ZJ, & Rauch, SL. Daytime sleepiness affects prefrontal inhibition of food consumption. Abstract presented at the 67th Annual Meeting of the Society of Biological

Psychiatry, Philadelphia, PA, May 3-5, 2012.

213. Rosso, IM, Britton, JC, Makris, N, **Killgore, WDS**, Rauch SL, & Stewart ES. Impact of major depression comorbidity on prefrontal and anterior cingulate volumes in pediatric OCD. Abstract presented at the 67th Annual Meeting of the Society of Biological Psychiatry, Philadelphia, PA, May 3-5, 2012.

214. Kipman, M, Weber, M, DelDonno, S., Schwab, ZJ, & **Killgore, WD**. Morningness-Eveningness correlates with orbitofrontal gray matter volume. Abstract presented at the 26th Annual Meeting of the Associated Professional Sleep Societies, Boston, MA, June 9-13, 2012.

215. Kipman, M, Schwab, ZJ, Weber, M, DelDonno, S, & **Killgore, WD**. Yawning frequency is correlated with reduced medial thalamic volume. Abstract presented at the 26th Annual Meeting of the Associated Professional Sleep Societies, Boston, MA, June 9-13, 2012.

216. Weber, M, DelDonno, S, Kipman M, Schwab, ZJ, & **Killgore WD**. Grey matter correlates of daytime sleepiness. Abstract presented at the 26th Annual Meeting of the Associated Professional Sleep Societies, Boston, MA, June 9-13, 2012.

217. Weber, M, DelDonno, S, Kipman M, Schwab, ZJ, & **Killgore WD**. Grey matter correlates of self-reported sleep duration. Abstract presented at the 26th Annual Meeting of the Associated Professional Sleep Societies, Boston, MA, June 9-13, 2012.

218. DelDonno, S, Weber, M, Kipman M, Schwab, ZJ, & **Killgore, WD**. Resistance to insufficient sleep correlates with olfactory cortex gray matter. Abstract presented at the 26th Annual Meeting of the Associated Professional Sleep Societies, Boston, MA, June 9-13, 2012.

219. DelDonno, S, Schwab, ZJ, Kipman, M, Weber, M, & **Killgore, WD**. Weekend sleep is related to greater coping and resilience capacities. Abstract presented at the 26th Annual Meeting of the Associated Professional Sleep Societies, Boston, MA, June 9-13, 2012.

220. Schwab, ZJ, DelDonno, S, Weber, M, Kipman M, & **Killgore, WD**. Habitual caffeine consumption and cerebral gray matter volume. Abstract presented at the 26th Annual Meeting of the Associated Professional Sleep Societies, Boston, MA, June 9-13, 2012.

221. Schwab, ZJ, & **Killgore, WD**. Daytime sleepiness affects prefrontal regulation of food intake. Abstract presented at the 26th Annual Meeting of the Associated Professional Sleep Societies, Boston, MA, June 9-13, 2012.

222. **Killgore, WD**, Schwab, ZJ, DelDonno S, Kipman, M, Weber M, & Rauch, SL. Greater nocturnal sleep time is associated with increased default mode functional connectivity. Abstract presented at the 26th Annual Meeting of the Associated Professional Sleep Societies, Boston, MA, June 9-13, 2012.

223. **Killgore, WD**, Kamimori, GH, & Balkin, TJ. Caffeine improves efficiency of planning and sequencing abilities during sleep deprivation. Abstract presented at the 26th Annual Meeting

of the Associated Professional Sleep Societies, Boston, MA, June 9-13, 2012.

224. Sneider, JT, **Killgore, WD**, Crowley, DJ, Cohen-Gilbert, JE, Schwab, ZJ, & Silveri, MM. Inhibitory capacity in emerging adult binge drinkers: Influence of Facial Cues. Abstract presented at the 35th Annual Scientific Meeting of the Research Society on Alcoholism, San Francisco, CA, June 23-27, 2012.

225. **Killgore WD**. Multimodal neuroimaging to predict cognitive resilience against sleep loss. Abstract presented at the DARPA Young Faculty Award 2012 Meeting, Arlington, VA, July 30-31, 2012. ***[*Winner Young Faculty Award in Neuroscience]***

226. Cohen-Gilbert, JE, **Killgore WD**, Crowley, DJ, Covell, MJ, Schwab, ZJ, Weiner, MR, Acharya, D, Sneider, JT, & Silveri, MM. Differential influence of safe versus threatening facial expressions on inhibitory control across adolescence and adulthood. Abstract presentede at the Society for Neuroscience 2012 Meeting, New Orleans, LA, October 13-17, 2012.

227. Weber, M, DelDonno, S, Kipman M, Schwab, ZJ, & **Killgore WD**. Grey matter correlates of self-reported sleep duration. Abstract presented at the Harvard Division of Sleep Medicine Annual Poster Session, Boston, MA, September 27, 2012.

228. Weber, M, DelDonno, SR, Kipman, M, Preer, LA, Schwab ZJ, Weiner, MR, & **Killgore, WD.** The effect of morning bight light therapy on sleep, cognition and emotion following mild traumatic brain injury. Abstract accepted for poster presentation at the 2012 Sleep Research Network Meeting, 22-23 October 2012, Bethesda, MD.

229. Sneider, JT, **Killgore, WD**, Crowley, DJ, Cohen-Gilbert, JE, Schwab, ZJ, & Silveri, MM. Inhibitory capacity in emerging adult binge drinkers: Influence of Facial Cues. Abstract presented at the Annual McLean Hospital Research Day, January 16, 2013.

230. Cohen-Gilbert, JE, **Killgore WD**, Crowley, DJ, Covell, MJ, Schwab, ZJ, Weiner, MR, Acharya, D, Sneider, JT, & Silveri, MM. Differential influence of safe versus threatening facial expressions on inhibitory control across adolescence and adulthood. Abstract presented at the Annual McLean Hospital Research Day, January 16, 2013.

231. Tkachenko, O, Schwab, ZJ, Kipman, M, DelDonno, S, Gogel, H., Preer, L, & **Killgore, WDS**. Smarter women need less sleep. Abstract presented at the Annual McLean Hospital Research Day, January 16, 2013.

232. DelDonno, S, Kipman, M, Schwab, ZJ, & **Killgore, WDS**. The contributions of emotional intelligence and facial perception to social intuition. Abstract presented at the Annual McLean Hospital Research Day, January 16, 2013.

233. Kipman, M, Schwab, ZJ, DelDonno, S, Weber, M, Rauch, SL, & **Killgore, WDS**. The neurocircuitry of impulsive behavior. Abstract presented at the Annual McLean Hospital Research Day, January 16, 2013.

234. Preer, LA, Tkachenko, O, Gogel, H, Schwab, ZJ, Kipman, M, DelDonno, SR, Weber, M,

Webb, CA, & **Killgore, WDS**. Emotional intelligence as a mediator of the association between anxiety sensitivity and anxiety symptoms. Abstract presented at the Annual McLean Hospital Research Day, January 16, 2013.

235. Gogel, H, DelDonno, S, Kipman M, Preer, LA, Schwab, ZJ, Tkachenko, O, & **Killgore, WDS**. Validation of the Design Organization Test (DOT) in a healthy population. Abstract presented at the Annual McLean Hospital Research Day, January 16, 2013.

236. Brennan, BP, Schwab, ZS, Athey, AJ, Ryan, EM, Pope, HG, **Killgore, WDS**, Jenike, MA, & Rauch, SL. A functional magnetic resonance imaging study of rostral anterior cingulate cortex activation in obsessive-compulsive disorder using an emotional counting stroop paradigm. Abstract presented at the Annual McLean Hospital Research Day, January 16, 2013.

237. Cohen-Gilbert, JE, Schwab, ZJ, **Killgore, WDS**, Crowley, DJ, & Silveri MM. Influence of Binge Drinking on the Neural Correlates of Inhibitory Control during Emotional Distraction in Young Adults. Abstract presented at the 3rd International Conference on Applications of Neuroimaging to Alcoholism (ICANA-3), New Haven, CT, February 15-18, 2013.

238. Weber, M, & **Killgore, WDS**. The interrelationship between 'sleep credit', emotional intelligence and mental health – a voxel-based morphometric study. Abstract presented at Harvard Medical School Psychiatry Research Day, April 10, 2013.

239. Cohen-Gilbert, JE, Schwab, ZJ, **Killgore, WDS**, Crowley, DJ, & Silveri MM. Influence of Binge Drinking on the Neural Correlates of Inhibitory Control during Emotional Distraction in Young Adults. Abstract presented at Harvard Medical School Psychiatry Research Day, April 10, 2013.

240. Mundy, EA, Weber, M, Rauch, SL, **Killgore, WDS**, & Rosso, IM. The relationship between subjective stress levels in childhood and anxiety as well as perceived stress as an adult. Abstract presented at Harvard Medical School Psychiatry Research Day, April 10, 2013.

241. Webb, CA, **Killgore, WDS**, Britton, JC, Schwab, ZJ, Price, LM, Weiner, MR, Gold, AL, Rosso, IM, Simon, NM, Pollack, MH, & Rauch, SL. Comparing categorical versus dimensional predictors of functional response across three anxiety disorders. Abstract presented at the 68th Annual Meeting of the Society of Biological Psychiatry, San Francisco, CA, May 16-18, 2013.

242. Preer, LA, Tkachenko, O, Gogel, H, Schwab, ZJ, Kipman, M, DelDonno, SR, Weber, M, Webb, CA, Rauch, SL, & **Killgore, WDS**. Linking Sleep Trouble to Neuroticism, Emotional Control, and Impulsiveness. Abstract presented at the 68th Annual Meeting of the Society of Biological Psychiatry, San Francisco, CA, May 16-18, 2013.

243. Preer, LA, Tkachenko, O, Gogel, H, Schwab, ZJ, Kipman, M, DelDonno, SR, Weber, M, Webb, CA, Rauch, SL, & **Killgore, WDS**. Emotional Intelligence as a Mediator of the Association between Anxiety Sensitivity and Anxiety Symptoms. Abstract presented at the 68th Annual Meeting of the Society of Biological Psychiatry, San Francisco, CA, May 16-18, 2013.

244. Kipman, M, Schwab, ZJ, DelDonno, S, Weber, M, Rauch, SL, & **Killgore, WDS**. The neurocircuitry of impulsive behavior. Abstract presented at the 68th Annual Meeting of the Society of Biological Psychiatry, San Francisco, CA, May 16-18, 2013.

245. Weber, M, **Killgore, WDS**, Rosso, IM, Britton, JC, Simon, NM, Pollack, MH, & Rauch, SL. Gray matter correlates of posttraumatic stress disorder—A voxel based morphometry study. Abstract presented at the 68th Annual Meeting of the Society of Biological Psychiatry, San Francisco, CA, May 16-18, 2013.

246. Weber, M, Penetar, DM, Trksak, GH, DelDonno, SR, Kipman, M, Schwab, ZJ, & **Killgore, WDS**. Morning blue wavelength light therapy improves sleep, cognition, emotion and brain function following mild traumatic brain injury. Abstract presented at the 68th Annual Meeting of the Society of Biological Psychiatry, San Francisco, CA, May 16-18, 2013.

247. Tkachenko, O, Schwab, ZJ, Kipman, M, Preer, LA, Gogel, H, DelDonno, SR, Weber, M, Webb, CA, Rauch, SL, & **Killgore, WDS**. Difficulty in falling asleep and staying asleep linked to a sub-clinical increase in symptoms of psychopathology. Abstract presented at the 68th Annual Meeting of the Society of Biological Psychiatry, San Francisco, CA, May 16-18, 2013.

248. **Killgore, WDS**, Schwab, ZJ, Kipman, M, DelDonno, SR, Rauch, SL, & Weber, M. Problems with sleep initiation and sleep maintenance correlate with functional connectivity among primary sensory cortices. Abstract presented at the 68th Annual Meeting of the Society of Biological Psychiatry, San Francisco, CA, May 16-18, 2013.

249. **Killgore, WDS**, Schwab, ZJ, Kipman, M, DelDonno, SR, Rauch, SL, & Weber, M. A Couple of Hours Can Make a Difference: Self-Reported Sleep Correlates with Prefrontal-Amygdala Connectivity and Emotional Functioning. Abstract presented at the 68th Annual Meeting of the Society of Biological Psychiatry, San Francisco, CA, May 16-18, 2013.

250. Brennan, BP, Schwab, ZS, Athey, AJ, Ryan, EM, Pope, HG, **Killgore, WDS**, Jenike, MA, & Rauch, SL. A functional magnetic resonance imaging study of rostral anterior cingulate cortex activation in obsessive-compulsive disorder using an emotional counting stroop paradigm. Abstract presented at the 68th Annual Meeting of the Society of Biological Psychiatry, San Francisco, CA, May 16-18, 2013.

251. Weber, M, & **Killgore, WDS**. The interrelationship between 'sleep credit', emotional intelligence and mental health – a voxel-based morphometric study. Abstract presented at the SLEEP 2013 Annual Meeting, Baltimore, MD, June 1-5, 2013.

252. Weber, M, Penetar, DM, Trksak, GH, DelDonno, SR, Kipman, M, Schwab, ZJ, & **Killgore, WDS**. Morning blue wavelength light therapy improves sleep, cognition, emotion and brain function following mild traumatic brain injury. Abstract presented at the SLEEP 2013 Annual Meeting, Baltimore, MD, June 1-5, 2013.

253. **Killgore, WDS**, Schwab, ZJ, Kipman, M, DelDonno, SR, & Weber, M. Problems with Sleep Initiation and Sleep Maintenance Correlate with Functional Connectivity Among Primary

Sensory Cortices. Abstract presented at the SLEEP 2013 Annual Meeting, Baltimore, MD, June 1-5, 2013.

254. **Killgore, WDS**, Schwab, ZJ, Kipman, M, DelDonno, SR, & Weber, M. A Couple of Hours Can Make a Difference: Self-Reported Sleep Correlates with Prefrontal-Amygdala Connectivity and Emotional Functioning. Abstract presented at the SLEEP 2013 Annual Meeting, Baltimore, MD, June 1-5, 2013.

255. Tkachenko, O, Schwab, ZJ, Kipman, M, DelDonno, SR, Preer, LA, Gogel, H, Weber, M, Webb, CA, & **Killgore, WDS**. Difficulty in falling asleep and staying asleep linked to a sub-clinical increase in symptoms of psychopathology. Abstract presented at the SLEEP 2013 Annual Meeting, Baltimore, MD, June 1-5, 2013.

256. Preer, LA, Tkachenko, O, Gogel, H, Schwab, ZJ, Kipman, M, DelDonno, SR, Weber, M, Webb, CA, & **Killgore, WDS**. Linking Sleep Initiation Trouble to Neuroticism, Emotional Control, and Impulsiveness. Abstract presented at the SLEEP 2013 Annual Meeting, Baltimore, MD, June 1-5, 2013.

257. **Killgore, WDS**. Sleep duration contributes to cortico-limbic functional connectivity, emotional functioning, & psychological health. Abstract accepted for presentation at the 52nd Annual Meeting of the American College of Neuropsychopharmacology, Hollywood, FL, December 8-12, 2013.

258. Preer, L, Tkachenko, O, Gogel, H, Bark, JS, Kipman, M, Olson, EA, & **Killgore, WDS**. The role of personality in sleep initiation problems. Abstract presented at the Annual McLean Hospital Research Day, January 22, 2014.

259. Demers, LA, Olson, EA, Weber, M, Divatia, S, Preer, L, & **Killgore, WDS**. Paranoid traits are related to deficits in complex social decision-making and reduced superior temporal sulcus volume. Abstract presented at the Annual McLean Hospital Research Day, January 22, 2014.

260. Tkachenko, O, Weber, M, Gogel, H, & **Killgore, WDS**. Predisposition towards unhealthy foods linked with increased gray matter in the cerebellum. Abstract presented at the Annual McLean Hospital Research Day, January 22, 2014.

261. Olson, EA, Weber, M, Tkachenko, O, & **Killgore, WDS**. Daytime sleepiness is associated with decreased integration of remote outcomes on the IGT. Abstract presented at the Annual McLean Hospital Research Day, January 22, 2014.

262. Cui, J, Tkachenko, O, & **Killgore, WDS**. Can the activation of anterior cingulate predict the emotional suppression? An fMRI study with masked faces. Abstract presented at the Annual McLean Hospital Research Day, January 22, 2014.

263. Gogel, H, & **Killgore WDS**. A psychometric validation of the Design Organization Test (DOT) in a healthy sample. Abstract presented at the 42nd Annual Meeting of the International Neuropsychological Society, Seattle WA, February 12-15, 2014.

264. **Killgore, WDS**, Kipman, M, Tkachenko, O, Gogel, H., Preer, L, Demers, LA, Divatia, SC, Olson, EA, & Weber, M. Predicting resilience against sleep loss with multi-modal neuroimaging. Abstract presented at the 42nd Annual Meeting of the International Neuropsychological Society, Seattle WA, February 12-15, 2014.

265. **Killgore, WDS**, Weber, M, Bark, JS, Kipman, M, Gogel, H, Preer, L, Tkachenko, O, Demers, LA, Divatia, SC, & Olson, EA. Physical exercise correlates with hippocampal volume in healthy adults. Abstract presented at the 42nd Annual Meeting of the International Neuropsychological Society, Seattle WA, February 12-15, 2014.

266. **Killgore, WDS**, Tkachenko, O, Weber, M, Kipman, M, Preer, L, Gogel, H, & Olson, EA. The association between sleep, functional connectivity, and emotional functioning. Abstract presented at the 42nd Annual Meeting of the International Neuropsychological Society, Seattle WA, February 12-15, 2014.

267. Preer, L, Tkachenko, O, Gogel, H, Bark, JS, Kipman, M, Olson, EA, & **Killgore, WDS**. The role of personality in sleep initiation problems. Abstract presented at the 42nd Annual Meeting of the International Neuropsychological Society, Seattle WA, February 12-15, 2014.

268. Tkachenko, O, Weber, M, Olson, EA, Gogel, H, Preer, LA, Divatia, SC, Demers, LA, & **Killgore, WDS**. Gray matter volume within the medial prefrontal cortex correlates with behavioral risk taking. Abstract presented at the 42nd Annual Meeting of the International Neuropsychological Society, Seattle WA, February 12-15, 2014.

269. Olson, EA, Weber, M, Bark JS, Demers L, Divatia, SC, Gogel, H, Kipman M, Preer, L, Tkachenko, O, & **Killgore, WDS**. Sex differences in threat evaluation of emotionally neutral faces. Abstract presented at the 42nd Annual Meeting of the International Neuropsychological Society, Seattle WA, February 12-15, 2014.

270. Cui, J, Tkachenko, O, & **Killgore, WDS**. Can the activation of anterior cingulate predict the emotional suppression? An fMRI study with masked faces. Abstract presented at the 36nd Annual Conference of the Anxiety Disorders Association of America, Chicago, IL, March 27-30, 2014.

271. Webb, CA, Weber, M, Mundy, EA, & **Killgore, WDS**. Reduced gray matter volume in the anterior cingulate, orbitofrontal cortex and thalamus as a function of depressive symptoms: A voxel-based morphometric analysis. Abstract presented at the 36nd Annual Conference of the Anxiety Disorders Association of America, Chicago, IL, March 27-30, 2014.

272. Weber, M, Penetar, DM, Trksak, GH, Kipman, M, Tkachenko, O, Bark, JS, Jorgensen, AL, Rauch, SL, & **Killgore, WDS**. Light therapy may improve sleep and facilitate recovery from mild traumatic brain injury. Abstract presented at the 10th World Congress on Brain Injury, San Francisco, CA, March 19-22, 2014.

273. Cui, J, Tkachenko, O, & **Killgore, WDS**. Can the activation of anterior cingulate predict the emotional suppression? An fMRI study with masked faces. Abstract presented at the 21st Annual Meeting of the Cognitive Neuroscience Society, Boston, MA, April 5-8, 2014.

274. Divatia, S, Demers, LA, Preer, L, Olson, EA, Weber, M, & **Killgore, WDS**. Advantageous decision making linked with increased gray matter volume in the ventromedial prefrontal cortex. Abstract presented at the 21st Annual Meeting of the Cognitive Neuroscience Society, Boston, MA, April 5-8, 2014.

275. Demers, LA, Olson, EA, Weber, M, Divatia, S, Preer, L, & **Killgore, WDS**. Paranoid traits are related to deficits in complex social decision making and reduced superior temporal sulcus volume. Abstract presented at the 21st Annual Meeting of the Cognitive Neuroscience Society, Boston, MA, April 5-8, 2014.

276. Preer, LA, Weber, M, Tkachenko, O, Divatia, S, Demers, LA, Olson, EA, & **Killgore, WDS**. Gray matter volume in the amygdala is associated with facial assessments of trustworthiness. Abstract presented at the 21st Annual Meeting of the Cognitive Neuroscience Society, Boston, MA, April 5-8, 2014.

277. Tkachenko, O, Weber, M, Gogel, H, & **Killgore, WDS**. Predisposition towards unhealthy foods linked with increased gray matter volume in the cerebellum. Abstract presented at the 21st Annual Meeting of the Cognitive Neuroscience Society, Boston, MA, April 5-8, 2014.

278. Olson, EA, Weber, M, Gogel, H, & **Killgore, WDS**. Daytime sleepiness is associated with decreased integration of remote outcomes on the IGT. Abstract presented at the 21st Annual Meeting of the Cognitive Neuroscience Society, Boston, MA, April 5-8, 2014.

279. Demers, LA, Preer, LA, Gogel, H, Olson, EA, Weber, M, & **Killgore, WDS**. Left-hemifield bias on sad chimeric face task correlates with interpersonal emotional intelligence. Abstract presented at the 69th Annual Meeting of the Society of Biological Psychiatry, New York, NY, May 8-10, 2014.

280. Weber, M, **Killgore, WDS**, Olson, EA, Rosso, IM, & Rauch, SL. Morphological brain network organization in relation to trauma and posttraumatic stress disorder. Abstract presented at the 69th Annual Meeting of the Society of Biological Psychiatry, New York, NY, May 8-10, 2014.

281. Divatia, S, Demers, LA, Preer, L, Gogel, H, Kipman, M, & **Killgore, WDS**. Schizotypal and manic traits are associated with poorer perception of emotions in healthy individuals. Abstract presented at the 69th Annual Meeting of the Society of Biological Psychiatry, New York, NY, May 8-10, 2014.

282. **Killgore, WDS**, Weber, M, Olson, EA, & Rauch, SL. Sleep reduction and functioning of the emotion regulation circuitry. Abstract presented at the 69th Annual Meeting of the Society of Biological Psychiatry, New York, NY, May 8-10, 2014. ***[*Blue Ribbon Finalist for Top Poster Award: Basic Neuroscience]***

283. Webb, CA, Weber, M, Mundy, EA, & **Killgore, WDS**. Reduced gray matter volume in the anterior cingulate, orbitofrontal cortex and thalamus as a function of depressive symptoms: A voxel-based morphometric analysis. Abstract presented at the 69th Annual Meeting of the Society of Biological Psychiatry, New York, NY, May 8-10, 2014.

284. Marin MF, Song H, Landau AJ, Lasko NB, Foy Preer LA, Campbell A, Pace-Schott EF, **Killgore WD**, Orr SP, Pitman RK, Simon NM, Milad MR (2014). Psychophysiological and Neuroimaging Correlates of Fear Extinction Deficits Across Anxiety Disorders. Abstract presented at the 69th Annual Meeting of the Society of Biological Psychiatry, New York, NY, May 8-10, 2014.

285. **Killgore, WDS**. The effects of sleep loss on food preference. Abstract presented at SLEEP 2014, Minneapolis, MN, May 31-June 4, 2014.

286. Weber, M, & **Killgore, WDS**. Sleep habits reflect in functional brain network organization. Abstract presented at SLEEP 2014, Minneapolis, MN, May 31-June 4, 2014. ***[*2014 AASM Young Investigator Award, Honorable Mention]***

287. Freed, MC, Novak, LA, **Killgore, WDS**, Koehlmoos, TP, Ginsberg, JP, Krupnick, J, Rauch S, Rizzo, A, Engle, CC. DoD IRB delays: Do they really matter? And if so, why and for whom? Abstract presented at the Military Health System Research Symposium, Fort Lauderdale, FL, August 18-21, 2014.

288. Freed, MC, Novak, LA, **Killgore, WDS**, Koehlmoos, TP, Ginsberg, JP, Krupnick, J, Rauch S, Rizzo, A, Engle, CC. DoD IRB delays: Do they really matter? And if so, why and for whom? Abstract accepted for presentation at the AMSUS Annual Meeting, Washington DC, December 2-5, 2014.

289. **Killgore, WDS**, Demers, LA, Olson, EA, Rosso, IM, Webb, CA, & Rauch, SL. Anterior cingulate gyrus and sulcus thickness: A potential predictor of remission following internet-based cognitive behavioral therapy for major depressive disorder. Abstract accepted for presentation at the 53rd Annual Meeting of the American College of Neuropsychopharmacology, Phoenix, AZ, December 7-11, 2014.

290. Olson, EA, Buchholz, J, Rosso, IM, **Killgore, WDS**, Webb, CA, Gogel, H, & Rauch, SL. Internet-based cognitive behavioral therapy effects on symptom severity in major depressive disorder: preliminary results from a randomized controlled trial. Abstract accepted for presentation at the 53rd Annual Meeting of the American College of Neuropsychopharmacology, Phoenix, AZ, December 7-11, 2014.

291. Brennan, B, Tkachenko, O, Schwab, Z, Ryan, E, Athey, A, Pope, H, Dougherty, Jenike, M, **Killgore, WDS**, Hudson, J, Jensen, E, & Rauch SL. Abstract accepted for presentation at the 53rd Annual Meeting of the American College of Neuropsychopharmacology, Phoenix, AZ, December 7-11, 2014.

292. Alkozei, A, Pisner, D, & **Killgore, WDS**. Emotional intelligence is differentially correlated with prefrontal cortical responses to backward masked fearful and angry faces. Abstract accepted for presentation at the 43rd Annual Meeting of the International Neuropsychological Society, Denver, CO, February 4-7, 2015.

293. Alkozei, A, Schwab, Z, & **Killgore, WDS**. Looking for evil intent: Emotional intelligence and the use of socially relevant facial cues during an emotional decision making task. Abstract accepted for presentation at the 43rd Annual Meeting of the International

Neuropsychological Society, Denver, CO, February 4-7, 2015.

294. Shane, BS, Alkozei, A, & **Killgore, WDS**. The contribution of general intelligence and emotional intelligence to the ability to appreciate humor. Abstract accepted for presentation at the 43rd Annual Meeting of the International Neuropsychological Society, Denver, CO, February 4-7, 2015.

295. Markowski, SM, Alkozei, A, & **Killgore, WDS**. Sleep onset latency and duration are associated with self-perceived invincibility. Abstract accepted for presentation at the 43rd Annual Meeting of the International Neuropsychological Society, Denver, CO, February 4-7, 2015.

296. Pisner, D, Alkozei, A, & **Killgore, WDS**. Visuospatial reasoning mediates the relationship between emotion recognition and emotional intelligence. Abstract accepted for presentation at the 43rd Annual Meeting of the International Neuropsychological Society, Denver, CO, February 4-7, 2015.

297. Vanuk, JR, Fridman, A, Demers, LA, Divatia, S, & **Killgore, WDS**. Engaging in meditation and internet based training as a means of enhancing emotional intelligence. Abstract accepted for presentation at the 43rd Annual Meeting of the International Neuropsychological Society, Denver, CO, February 4-7, 2015.

298. Vanuk, JR, Divatia, S, Demers, LA, Markowski, SM, & **Killgore, WDS**. Napping in conjunction with brief internet-based training as a means of enhancing emotional intelligence. Abstract accepted for presentation at the 43rd Annual Meeting of the International Neuropsychological Society, Denver, CO, February 4-7, 2015.

299. Cui, J, Tkachenko, O, Gogel, H, Kipman, M, Preer, LA, Weber, M, Divatia, SC, Demers, LA, Olson, EA, Buchholz, JL, Bark, JS, Rosso, IM, Rauch, SL, & **Killgore, WDS**. Fractional Anisotropy of frontoparietal connections presicts individual resistance to sleep deprivation. Abstract accepted for presentation at the 43rd Annual Meeting of the International Neuropsychological Society, Denver, CO, February 4-7, 2015.

300. **Killgore, WDS**, Olson, EA, Weber, M, Rauch, SL, & Nickerson, LD. Emotional intelligence is associated with coordinated resting state activity between emotion regulation and interoceptive experience networks. Abstract accepted for presentation at the 43rd Annual Meeting of the International Neuropsychological Society, Denver, CO, February 4-7, 2015.

301. **Killgore, WDS**, Demers, LA, Divatia, S, Kipman, M, Tkachenko, O, Weber, M, Preer, LA, Gogel, H, Olson, EA, Vanuk, JR, & Rauch, SL. Enhancing emotional intelligence via brief internet-based training. Abstract accepted for presentation at the 43rd Annual Meeting of the International Neuropsychological Society, Denver, CO, February 4-7, 2015.

302. Buchholz, JL, Rosso, IM, Olson, EA, **Killgore, WDS**, Fukunaga, R, Webb, CA, & Rauch, SL. Internet-based cognitive behavioral therapy is associated with symptom reduction and cognitive restructuring in adults with major depressive disorder. Abstract submitted for presentation at the Anxiety and Depression Conference, Miami, FL, April 9-12, 2015.

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304. Alkozei, A, Pisner, D, Markowski, SM, Rauch, SL, & **Killgore, WDS**. The effect of emotional resilience on changes in appetitie for high-sugary food during sleep loss. Abstract submitted for presentation at the SLEEP 2015 Meeting, Seattle, WA, June 6-10, 2015.

305. Markowski, SM, Alkozei, A, Rauch, SL, & **Killgore, WDS**. Self-perceived invincibility is associated with sleep onset latency and duration. Abstract submitted for presentation at the SLEEP 2015 Meeting, Seattle, WA, June 6-10, 2015.

306. Markowski, SM, Alkozei, A, Rauch, SL, & **Killgore, WDS**. Sex differences in the association between personality and resistance to sleep deprivation. Abstract submitted for presentation at the SLEEP 2015 Meeting, Seattle, WA, June 6-10, 2015.

307. Shane, BR, Alkozei, A, & **Killgore, WDS**. Physical exercise may contribute to vulnerability to sleep deprivation. Abstract submitted for presentation at the SLEEP 2015 Meeting, Seattle, WA, June 6-10, 2015.

308. Cui, J, Tkachenko, O, Gogel, H, Kipman, M, Sonis, LA, Weber, M, Divatia, SC, Demers, LA, Olson, EA, Buchholz, JL, Rosso, IM, Rauch, SL, & **Killgore, WDS**. Resistance to sleep deprivation involves greater functional activation and white matter connectivity within a fronto-parietal network. Abstract submitted for presentation at the SLEEP 2015 Meeting, Seattle, WA, June 6-10, 2015.

309. Vanuk, JR, Rosso, IM, Rauch, SL, Alkozei, A, Markowski, SM, Pisner, D, Shane, BR, Fridman A, Knight, SA, & **Killgore, WDS**. Daytime sleepiness is associated with altered thalamocortical connectivity. Abstract submitted for presentation at the SLEEP 2015 Meeting, Seattle, WA, June 6-10, 2015.

310. Sneider, JT, Jensen JE, Silveri, MM, & **Killgore, WDS**. Prefrontal GABA predicts resistance to sleep deprivation. Abstract submitted for presentation at the SLEEP 2015 Meeting, Seattle, WA, June 6-10, 2015.

311. **Killgore, WDS**, Tkachenko, O, Gogel, H, Kipman, M, Sonis, LA, Weber, M, Divatia, SC, Demers, LA, Olson, EA, Buchholz, JL, Rosso, IM, & Rauch, SL. Individual differences in rested activation of the ventral striatum predict overeating during sleep deprivation. Abstract submitted for presentation at the SLEEP 2015 Meeting, Seattle, WA, June 6-10, 2015.

312. **Killgore, WDS**, Tkachenko, Rosso, IM, Rauch, SL, & Nickerson, LA. Multimodal neuroimaging to predict resistance to sleep deprivation. Abstract submitted for presentation at the SLEEP 2015 Meeting, Seattle, WA, June 6-10, 2015.

313. Alkozei, A, Pisner, D, Rauch, SL, & **Killgore, WDS**. Emotional intelligence and subliminal presentations of social threat. Abstract submitted for presentation at the 70th Annual Meeting of the Society of Biological Psychiatry, Toronto, Ontario, CA, May 14-16, 2015.

314. Shane, BR, Alkozei, A, Vanuk, JR, Weber, M, & **Killgore, WDS**. The effect of bright light therapy for improving sleep among individuals with mild traumatic brain injury. Abstract submitted for presentation at the 70th Annual Meeting of the Society of Biological Psychiatry, Toronto, Ontario, CA, May 14-16, 2015.

315. Vanuk, JR, Shane, BR, Alkozei, A, & **Killgore, WDS**. Trait emotional intelligence is associated with greater resting state functional connectivity within the default mode and task positive networks. Abstract submitted for presentation at the 70th Annual Meeting of the Society of Biological Psychiatry, Toronto, Ontario, CA, May 14-16, 2015.

316. Vanuk, JR, Fridman, A, Demers, LA, & **Killgore, WDS**. Engaging in meditation and internet-based training as a means of enhancing emotional intelligence. Abstract submitted for presentation at the 70th Annual Meeting of the Society of Biological Psychiatry, Toronto, Ontario, CA, May 14-16, 2015.

317. Pisner, D, Alkozei, A, & **Killgore, WDS**. Trait emotional suppression is associated with decreased activation of the insula and thalamus in response to masked angry faces. Abstract submitted for presentation at the 70th Annual Meeting of the Society of Biological Psychiatry, Toronto, Ontario, CA, May 14-16, 2015.

318. Markowski, SM, Alkozei, A, & **Killgore, WDS**. The trait of neuroticism predicts neurocognitive performance in healthy individuals. Abstract submitted for presentation at the 70th Annual Meeting of the Society of Biological Psychiatry, Toronto, Ontario, CA, May 14-16, 2015.

319. Buchholz, JL, Rosso, IM, **Killgore, WDS**, Fukunaga, R, Olson, EA, Demers, LA, & Rauch, SL. Amygdala volume is associated with helplessness in adults with major depressive disorder (MDD). Abstract submitted for presentation at the 70th Annual Meeting of the Society of Biological Psychiatry, Toronto, Ontario, CA, May 14-16, 2015.

320. Sneider, JT, **Killgore, WDS**, Rauch, SL, Jensen, JE, & Silveri, MM. Sex differences in the associations between prefrontal GABA and resistance to sleep deprivation. Abstract submitted for presentation at the 70th Annual Meeting of the Society of Biological Psychiatry, Toronto, Ontario, CA, May 14-16, 2015.

321. **Killgore, WDS**, Rosso, IM, Rauch, SL, & Nickerson, LD. Emotional intelligence correlates with coordinated resting state activity between brain networks involved in emotion regulation and interoceptive experience. Abstract submitted for presentation at the 70th Annual Meeting of the Society of Biological Psychiatry, Toronto, Ontario, CA, May 14-16, 2015.

322. **Killgore, WDS**, Demers, LA, Divatia, S, Rosso, IM, & Rauch, SL. Boosting Emotional intelligence with a brief internet-based program. Abstract submitted for presentation at the 70th Annual Meeting of the Society of Biological Psychiatry, Toronto, Ontario, CA, May 14-16, 2015.

323. **Killgore, WDS**, Vanuk, JR, Alkozei, A, Markowski, SM, Pisner, D, Shane, BR, Fridman, A, & Knight, SA. Greater daytime sleepiness correlates with altered thalamocortical connectivity. Abstract submitted for presentation at the 70th Annual Meeting of the Society of

Biological Psychiatry, Toronto, Ontario, CA, May 14-16, 2015.

324. **Killgore, WDS**, Tkachenko, O, Gogel, H, Kipman, M, Sonis, LA, Divatia, SC, Demers, LA, Olson, EA, Buchholz, JL, Rosso, IM, & Rauch, SL. Activation of the ventral striatum predicts overeating during subsequent sleep loss. Abstract submitted for presentation at the 70th Annual Meeting of the Society of Biological Psychiatry, Toronto, Ontario, CA, May 14-16, 2015.

Narrative Report (limit to 500 words)

My research has emphasized the study of higher order cognition and executive functions and how these cognitive abilities are influenced and guided by subtle affective processes. Over the past 12 years, my research has utilized functional and structural magnetic resonance imaging to study the interaction of affective processes and cognition within limbic networks of the medial temporal lobes and prefrontal cortex. This line of research has led to the refinement of a developmental model of prefrontal cortical-limbic maturation that explains how these processes contribute to the way adolescents perceive emotionally and motivationally relevant stimuli such as affective faces and visual images of food. As a result of the Iraq War, I took an extended leave of absence to serve in the Active Duty Army as the Chief of the Neurocognitive Performance Branch at the Walter Reed Army Institute of Research from 2002-2007. During that time, I extended the scope of my affective processing research to also examine the effects of stressors such as prolonged sleep deprivation, chronic sleep restriction, nutritional deprivation, and the use of stimulant countermeasures on the cognitive-affective systems within the brain. This line of investigation suggests that sleep deprivation alters the metabolic activity within the medial prefrontal cortex, resulting in subtle but profound effects on specific aspects of cognition. These sleep-loss related prefrontal decrements impair the ability to use affective processes to guide judgment and decision-making, particularly in high-risk or morally relevant situations. My recent investigations also suggest that while commonly used stimulants such as caffeine, modafinil, and dextroamphetamine are highly effective at reversing sleep-loss induced deficits in alertness and vigilance, they have virtually no restorative effect on the cognitive-affective decision-making systems of the brain. Having left military service to return to McLean Hospital full time in the summer of 2007, I have since been extending my previous work to identify the extent to which these cognitive-affective decision-making systems and their neurobiological substrates are impaired or altered in patients suffering from anxiety disorders and post-traumatic stress. During the past five years I have also successfully secured multiple grants from the DoD and DARPA totaling more than $7.8M, including a study of the neural basis of emotional intelligence, a study of a novel light treatment for improving sleep and cognitive functioning in mTBI, and a neuroimaging study of the effectiveness of an internet based cognitive-behavior therapy program, a neuroimaging study of axonal damage in mTBI, and a study of the neural basis of resilience against the adverse effects of sleep deprivation. In early 2011, I was named Co-Director of the Social, Cognitive, and Affective Neuroscience Lab at McLean Hospital.

My recent teaching activities have primarily involved daily supervision and training of student research assistants and postdoctoral fellows, as well as occasional seminar presentations. Over the past 6 years, I have closely and regularly mentored more than 25 students at the undergraduate, graduate, and post-doctoral level. This involvement has included one-on-one supervision and training in basic research methods, neuropsychological assessment, statistical analysis, and manuscript preparation. Nearly all of my advisees have served as co-authors on abstracts, posters, talks, and published manuscripts based on my research program.

The Effect of Morning Bright Light Therapy on Sleep, Cognition and Brain Function Following Mild Traumatic Brain Injury

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Sleep disturbance is one of the most frequently reported symptoms following mild traumatic brain injury (TBI). Post-TBI sleep problems are difficult to treat and can persist for years after the injury, resulting in significant personal suffering and daytime cognitive and emotional impairment. Recent evidence suggests that mild TBI may offset the circadian rhythm of alertness, yielding irregular sleepwake patterns and delayed sleep phase disorder. As sleep is important for neuroplasticity and therefore also recovery from mild TBI, it is imperative to identify and evaluate non-pharmacological treatments to enhance sleep. Because of its effects on the melatonin rhythm, blue wavelength light may be particularly helpful in entraining the circadian rhythm to improve sleep and subsequently enhance cognition, emotion and brain function following mild TBI. We present preliminary data (N=14) on the effect of a 6-week morning exposure to blue light on sleep, cognition, emotion and brain function in individuals with mild TBI compared to placebo amber light. The blue light intervention yielded a marked increase in mean sleep minutes per sleep interval and improvements in neuropsychological measures of attention and speed of information processing, memory and executive functioning. In addition, subjective symptoms and daytime sleepiness decreased, while mood improved. Whereas these preliminary findings will need to be confirmed using the full data set (N=30), they offer promising support to the potential efficacy of blue light therapy in the treatment of sleep disturbance following mild TBI. Future analyses will also determine whether and how these objectively and subjectively assessed cognitive and emotional improvements relate to brain functional and structural changes.

MORNING BLUE WAVELENGTH LIGHT THERAPY IMPROVES SLEEP, COGNITION, EMOTION AND BRAIN FUNCTION FOLLOWING MILD TRAUMATIC BRAIN INJURY

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Background: Mild traumatic brain injury (TBI) may offset the circadian rhythm of alertness, resulting in irregular sleep-wake patterns, delayed sleep onset, and degraded cognitive-emotional functioning. Given that sleep plays a pivotal role in neuroplasticity and recovery from TBI, effective treatments that improve sleep following TBI, but exert no adverse side effects need to be identified and evaluated. Because blue wavelength light affects melatonin rhythm, it may be particularly effective to re-entrain the circadian rhythm following TBI, and to improve sleep and subsequently cognition, emotion and brain function.

Methods: We present preliminary data (N=18; mean age = 24.3±8.6, 50% female) on the effect of a 6-week morning exposure to blue light on sleep, cognition, emotion and brain function in individuals with mild TBI compared to placebo amber light. Participants underwent comprehensive psychiatric and neuropsychological assessment, Multiple Sleep Latency Tests, actigraphy, and magnetic resonance imaging before and after the intervention.

Results: Compared to placebo, the blue light intervention yielded a marked increase in mean sleep minutes per sleep interval and improvements in neuropsychological measures of attention and speed of information processing, memory and executive functioning. In addition, subjective symptoms and daytime sleepiness decreased, while mood improved (all $p<.05$).

Conclusion: These data offer promising support to the potential efficacy of blue light therapy in the treatment of sleep disturbance following mild TBI, but need to be confirmed using the full data set (N=30). Future analyses will also determine whether and how these objectively and subjectively assessed cognitive and emotional improvements relate to brain functional and structural changes.

MORNING BLUE WAVELENGTH LIGHT THERAPY IMPROVES SLEEP, COGNITION, EMOTION AND BRAIN FUNCTION FOLLOWING MILD TRAUMATIC BRAIN INJURY

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Background: Sleep disturbance is one of the most frequently reported symptoms following a mild traumatic brain injury (TBI). Indeed, evidence suggests that the circadian rhythm of alertness may be offset by mild TBI, resulting in irregular sleep-wake patterns and delayed sleep onset. It is essential to improve sleep following TBI, without inducing adverse side effects, as sleep is crucial to neuroplasticity and recovery from TBI. Blue wavelength light might be particularly effective in TBI-related sleep disturbance, as it affects melatonin production and thus may help re-entrain the circadian rhythm, resulting in improved sleep, cognition, emotion, and brain function.

Methods: We present preliminary data from 18 individuals (mean age = 24.3±8.6, 50% female) with a documented history of at least one mild traumatic brain injury and sleep disturbance that either emerged or was aggravated with the most recent injury (at least four weeks, but not more than 18 months post-TBI). Participants were randomized to either six weeks of 30-minutes daily blue wavelength or amber wavelength (placebo) light therapy. In addition to Multiple Sleep Latency Tests, actigraphy and sleep diaries, all participants underwent magnetic resonance imaging and comprehensive psychiatric and neuropsychological assessment before and after the intervention.

Results: In contrast to the placebo condition, six weeks of morning blue wavelength light therapy resulted in a marked increase in mean sleep minutes per sleep interval and performance improvements on measures of attention, speed of information processing, memory and executive functioning. Furthermore, daytime sleepiness decreased and self-reported injury-related symptoms decreased, while mood improved (all $p<.05$).

Conclusion: Despite their preliminary character, the data suggest that blue light therapy may present an effective method to treat TBI-related sleep disturbance. In addition to confirming these preliminary results using the full data set (N=30), future analyses will also establish the relationship between the intervention, brain function, brain structure and brain connectivity.

Light Therapy May Improve Sleep and Facilitate Recovery from Mild Traumatic Brain Injury

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Objectives: Sleep disturbance is one of the most frequently reported and persisting symptoms following mild traumatic brain injury (TBI). Indeed, mild TBI may disrupt the circadian rhythm of alertness and sleep-wake patterns. Although sleep is critical to neuroplasticity and, therefore, recovery from the injury, there is a dearth of effective, non-pharmacological treatments that both improve sleep following mild TBI and lack adverse side effects. Because of its regulating effects on the production of sleep-promoting melatonin, morning exposure to short wavelength light may effectively improve sleep via re-entrainment of the circadian rhythm.

Method: We present preliminary data from 18 individuals with mild TBI aged 18 to 45 (50% female) who were randomized to either active or placebo light treatment using light therapy devices fitted with light-emitting diodes (LEDs). The active treatment devices were fitted with blue LEDs (469 nm) and the placebo devices were fitted with amber LEDs (578 nm). Participants used the devices for 30 minutes each day, within two hours of awakening and before 11:00 am each morning for six weeks. All participants underwent comprehensive neuroimaging (including structural and functional magnetic resonance imaging and diffusion-weighted imaging), psychiatric and neurobehavioral assessment, actigraphy, and Multiple Sleep Latency Tests before and after the intervention.

Results: The treatment group showed significant reductions in daytime sleepiness, accompanied by improvements in overall sleep quality, sleep quantity, and cognitive measures of attention. More importantly, neuroimaging showed brain functional changes in regions involved in sleep-wake regulation such as thalamus and prefrontal cortex in the treatment, but not the placebo group.

Conclusion: Short wavelength light therapy might be a potentially effective non-pharmacological approach with no known adverse side effects to improve sleep and to facilitate recovery from mild TBI. These data are preliminary and need to be confirmed using the full data set (N=30). Future analyses will also determine whether and how brain functional changes relate to changes in white matter microarchitecture.

The Effect of Bright Light Therapy on Improving Sleep Among Individuals with Mild Traumatic Brain Injury

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Background:
Sleep problems, including excessive daytime sleepiness, are seen in about 50% of patients with mild Traumatic Brain Injuries (mTBI), and can negatively affect mood and cognitive performance. Since blue wavelength light has a strong influence on sleep patterns, melatonin suppression, and circadian rhythmicity, we hypothesized that 6-weeks of daily exposure to Morning Blue Light Therapy (MBLT) compared to an amber Sham Placebo Light Treatment (SPLT) would significantly improve daytime sleepiness from pre- to post-treatment.

Methods:
Twenty-nine subjects (ages 18 -48), who experienced a mTBI in the past 18-months coupled with comorbid sleep difficulties, underwent an six-week light therapy using a bright light device every morning for 30 minutes. 14 subjects received MBLT and 12 subjects received SPLT. Participants also reported their daytime sleepiness using the Epworth Sleepiness Scale (ESS) before and after treatment. A mixed ANOVA was used to analyze ESS ratings between the two groups.

Results:
There was a significant treatment x time interaction on ESS scores ($F(1,24)=4.485$, $p=0.04$). Post-hoc comparisons showed that, on average, individuals in the MBLT group showed a 15.08% decrease in daytime sleepiness ratings on the ESS compared to a 4.26% increase for individuals in the SPLT group ($p<.05$).

Conclusions:
The findings suggest that MBLT is an effective treatment for reducing post-concussion daytime sleepiness. Further work will be necessary to evaluate the effectiveness of MBLT on objective measures of sleep and sleepiness and the underlying neural mechanisms, as well as whether these changes are associated with improvements in cognitive functioning and emotional wellbeing.

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Review Article Open Access

A Brief and Selective Review of Treatment Approaches for Sleep Disturbance following Traumatic Brain Injury

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Abstract

Sleep disturbance often presents as a clinically significant symptom of Traumatic Brain Injury (TBI). Poor sleep may delay recovery, exacerbate psychiatric comorbidities, and even increase suicidal risk among TBI patients. Thus, effective and efficient treatment of sleep disturbance in this population is critical. This review provides a brief, selective, and focused synopsis of several of the more common and empirically tested pharmacological and behavioral approaches and their efficacy in the treatment of sleep disturbance following TBI. Depending on the nature of the injury and the specific sleep-related problems, there may be appropriate uses for pharmacologic interventions such as hypnotic or wake-promoting agents, cognitive-behavioral therapy, sleep hygiene, circadian rhythm modification, or even alternative medicine approaches. Overall, the literature on this important topic is sparse, and existing studies are hampered by relatively small sample sizes, under representation of youth and females, inconsistencies across reports in both time since injury and injury severity. Existing methodological limitations do not currently allow for definitive conclusions regarding the effectiveness of particular treatment approaches. Future research will not only need to address these limitations, but also develop treatment options for children and adolescents, who are currently underrepresented in the literature.

Keywords: Sleep; Traumatic brain injury; Treatment; Therapy; Melatonin; Modafinil; CBT-I; Blue light; Sleep-hygiene

Introduction

Sufficient sleep, both in terms of quantity and quality, is essential for cognitive performance and emotional wellbeing [1], and plays an important role in an individual's overall subjective quality of life [2]. Without sufficient restorative sleep, a person's reaction time is slowed, attentional lapses are more frequent [3,4], and there is an increased risk of work-related injuries and motor vehicle accidents [5]. Lack of sleep affects mood [6], emotional coping capacities [7], and even leads to increased symptoms of anxiety and depression among healthy individuals [8]. At the highest cognitive and emotional levels, sleep loss can degrade decision-making [9,10] and impair complex judgment and reasoning capacities [11,12]. Moreover, insufficient restorative sleep can lead to a number of health-related problems, including greater risk of weight gain and obesity, type 2 diabetes, metabolic problems, and hypertension [13,14]. Thus, regardless of the factors involved, chronically disturbed sleep can have adverse effects on health, emotional wellbeing, and normal cognitive functioning. It is therefore essential for medical practitioners and other clinicians to be aware of the presence of sleep disorders and to provide effective and efficient treatment of these problems when they are identified.

Whereas patients who present with primary sleep complaints, such as insomnia or sleep-related breathing problems, may be easy to identify, there are often clinical situations in which a patient may also have a sleep disorder that goes undiagnosed and untreated because it is not the primary presenting problem. This may often be the case among patients recovering from Traumatic Brain Injury (TBI). Following a TBI, physicians and other practitioners may focus on more overt problems associated with the injury and fail to adequately assess the presence of sleep-related problems in these patients. In fact, recent studies suggest that sleep problems may actually be some of the most common complaints among patients with TBI, with nearly half reporting some insomnia-related problems following their injury [15]. This is particularly troublesome, as sleep may be a vital component of the brain repair and recovery process. For instance, recent animal research suggests that sleep may play a critical role in neural plasticity. Lack of sleep appears to suppress the proliferation of new hippocampal neurons in the dentate gyrus of laboratory animals independent of its effects on circadian disruption or stress hormones [16,17]. Perhaps even more importantly, sleep appears to be essential in the process of neural re growth and regeneration following experimentally induced brain lesions in animals [16,18-20]. For example, rats subjected to experimentally manipulated sleep disturbance following an induced cerebral ischemic stroke showed significantly poorer recovery of function in the post-stroke period compared to those with normal sleep [19]. Thus, emerging evidence suggests that sleep is an important factor in healthy brain development, and plays a vital role in the growth and regeneration of neurons following brain damage.

The role of sleep in recovery from brain injury suggests that treating sleep disturbance in neurological conditions such as TBI might be particularly important in facilitating maximal recovery. Indeed, poor sleep, one of the most frequently reported TBI-related symptoms [21], was shown to complicate recovery from brain injury [22]. The need for effective and efficient treatment protocols in the context of TBI can be assumed to be substantial given the high prevalence and incidence of TBI in both civilian and military personnel – approximately 1.7 million TBIs occur annually in the United States alone [23]. Moreover, approximately 50% of TBI patients report some type of subjective sleep disturbance following their injury [15]. In fact, irrespective of injury

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severity, subjective complaints of poor sleep such as difficulty falling or staying asleep, increased need for daytime naps, excessive daytime sleepiness, or increased fatigue may emerge at any stage following TBI [24]. Furthermore, these complaints appear to increase for up to six weeks following the injury [25] and are often still apparent even 3 years later [26]. Notably, for those patients still in the hospital, sleep maintenance difficulties were most common (81%), while problems with excessive daytime sleepiness were most frequently reported among patients following discharge (73%). In addition to high rates of subjective complaints of insomnia and other sleep problems, TBI patients also show some evidence of objective sleep changes, such as reduced Rapid Eye Movement (REM) sleep and increased stage 2 Non-Rapid Eye Movement (NREM) sleep compared to healthy controls [27]. Another study reported greater slow wave NREM sleep among military veteran patients with TBI compared to veterans with other clinical conditions, and also showed that these patients spent significantly less sleep time awake compared to other groups [28]. However, the evidence for objective sleep problems identified via polysomnography is considerably less consistent than that for subjective complaints [24]. While it is possible that a preexisting subjective sleep problem might worsen following a TBI, a substantial proportion of the sleep disturbances seen following TBI are believed to be a direct result of the injury itself [29].

Matters are complicated by the fact that neither TBI nor sleep disturbance are uniform constructs. The manifestation of TBI can vary greatly depending on the severity of the injury (i.e., mild, moderate, severe), the type of injury (e.g., blunt trauma; open head wound; blast-related; etc.), and the direction of force and location of damage within the brain. Furthermore, these factors may also contribute to the heterogeneous expression of sleep disruption among TBI patients. Some patients may experience higher rates of obstructive sleep apnea, narcolepsy, or periodic limb movements [30,31], while others may experience circadian rhythm disruption such as delayed sleep phase disorder [32]. A recent prospective study using clinician ratings reported that 84% of TBI patients showed evidence of sleep-wake cycle abnormalities at admission to a rehabilitation unit within days after injury, which declined to 66% within one month following their TBI [33]. Interestingly, the severity of sleep disturbance also predicted duration of post-traumatic amnesia. Some patients may experience symptoms consistent with sleep onset insomnia, while others may fall asleep relatively easily but have difficulty maintaining sleep throughout the night. For many, excessive daytime sleepiness or fatigue may be the primary problem [24]. Depending on the nature of the specific sleep disorder, some treatments will be more or less effective, so it is imperative that the clinician conduct a thorough assessment to identify the idiosyncratic sleep problems presented by the patient and tailor treatments to address their particular symptoms or underlying causes.

Within the context of TBI, poor sleep may also exacerbate comorbid psychiatric disorders such as depression or anxiety, or even the experience of pain [25,34]. Of note, insomnia following combat-related mild TBI was shown to predict suicidality [35], highlighting the vital importance of treating sleep disturbance following TBI. These injuries may also be associated with changes in sleep micro- and macro architecture, reduced sleep efficiency, more nighttime awakenings, prolonged sleep onset latency, and increased sleep fragmentation [24], although the clinical significance and reproducibility of many of these changes is uncertain due to the large inconsistencies and methodological limitations across much of the existing literature. Likewise, the empirical evidence of neuropsychological and neurophysiologic correlates of subjective or objective sleep disturbance following TBI is inconsistent at best, and does not allow for the formation of robust conclusions presently [24]. Despite the high prevalence and incidence of subjective sleep disturbance following TBI, the current literature provides little consistent guidance on effective treatment options. Consequently, many clinicians may be generally unaware of the magnitude of the problem of sleep disturbance following TBI and have little information regarding currently accepted treatment approaches. To address this dearth of information, we provide a brief and selective review of the most widely explored treatments for sleep problems following TBI. The present review is not meant to be an exhaustive description or comprehensive evaluation of the scientific literature on sleep treatments. Rather, we selectively reviewed the literature and present a concise overview of the most well-accepted and potentially promising treatments, while highlighting some of the major gaps in the current knowledge about these approaches. These are covered briefly below in the following sections: hypnotic interventions, wake-promoting interventions, Cognitive Behavioral Therapy (CBT) & sleep hygiene, circadian rhythm interventions, and alternative approaches.

Hypnotic interventions

Because patients with TBI often complain of symptoms of insomnia (i.e., problems with sleep onset, sleep maintenance, or delayed sleep phase disorder), there may be occasions where sleep-inducing medications may be prescribed. Such medications may be useful for short-term treatment of sleeplessness. However, the use of sedative-hypnotic agents to promote sleep in adults with TBI is controversial and even discouraged by some, as TBI is often associated with an already high medication burden [36]. More importantly, however, it has been suggested that sleep inducers may potentially delay cognitive recovery from TBI [37] and leave subjective complaints of poor sleep unaffected [38]. In particular, Larson and Zollman [37] reported that typical sleep inducers such as benzodiazepines and atypical gamma-aminobutyric acid (GABA) agonists may be problematic due to their effects on cognitive functioning during peak plasma concentrations and may even impair neuroplasticity. This raises concern that such agents might adversely affect optimal recovery from brain injury. Clearly, patients prescribed such medications should be routinely followed and monitored for safety, effectiveness, and potential effects on recovery. Further research on this topic is greatly needed.

Wake-promoting interventions

For many TBI patients, their primary complaint is fatigue or excessive somnolence during daytime hours. Excessive daytime sleepiness can have a major effect on quality of life and increases the potential for work-related injuries and automobile accidents. Consequently, there may be times when wake-promoting agents might be prescribed to a TBI patient with associated excessive somnolence problems. Modafinil is a wake-promoting agent that is approved for the treatment of excessive daytime sleepiness in narcolepsy, obstructive sleep apnea, or sleep disorder due to shift work. Presumably, modafinil (or its longer acting enantiomer armodafinil) would have a similar wake promoting effect in TBI patients suffering from excessive daytime somnolence. Indeed, a small sample of patients with chronic TBI (severity not reported) and excessive daytime sleepiness showed improved daytime vigilance and normalized nighttime sleep via self-report following five to 13 months of 100-400 mg modafinil administered each morning [39]. In a randomized clinical trial including a small (mostly male) adult sample of individuals with mild and severe TBI at the chronic recovery stage and with subjective excessive daytime sleepiness or fatigue, six weeks of 100-200 mg of morning modafinil significantly reduced subjective daytime sleepiness, but not reports of

fatigue compared to placebo [40]. The intervention also improved the objective ability to stay awake in sleep-inducing conditions (i.e., the Maintenance of Wakefulness Test, MWT) and increased sleep latency compared to placebo. Of note, neither the modafinil nor the placebo group produced a clear improvement in subjective ratings of vigilance, suggesting restrictions in modafinil's efficacy in restoring some aspects of cognitive functioning in patients with TBI. This limitation is further supported by two studies in chronic mild to severe TBI and comorbid sleep disturbance (i.e., either narcolepsy, posttraumatic hypersomnia, subjective daytime sleepiness or fatigue) that could not replicate modafinil's beneficial effect on daytime sleepiness, daytime alertness, nighttime sleep or cognitive functioning [30,41]. However, even in healthy individuals, modafinil is often less likely to lead to subjective feelings of arousal (e.g., nervousness, excitation, jitteriness, pounding heart) compared to other types of stimulants such as caffeine [42], potentially leading to a discrepancy between objective and subjective alertness. Thus, there is some limited evidence to support the use of modafinil in aiding objective daytime alertness in TBI patients, but the findings have been inconsistent and further study is clearly needed. More evidence regarding the effects of the longer acting enantiomer, armodafinil, are needed before clear guidelines can be established.

Cognitive behavioral therapy for insomnia (CBT-I)& sleep hygiene

A range of effective non-pharmacological approaches to treating insomnia have been developed, including sleep hygiene education, sleep restriction, stimulus control therapy and relaxation-based interventions [21,43]. One particularly promising approach is Cognitive Behavioral Therapy for insomnia (CBT-I) [44]. CBT-I is a four-to-eight session multi component intervention, which targets factors maintaining insomnia, including both sleep-interfering behaviors and cognitions. CBT-I combines behavioral (e.g., stimulus control, sleep restriction) and cognitive (i.e., restructuring of maladaptive sleep-related cognitions and intrusive pre-sleep thoughts) interventions, as well as incorporating psycho-education regarding sleep. A growing body of evidence supports the efficacy of CBT-I in the treatment of insomnia. Findings from a recently published meta-analysis of randomized controlled trials (RCTs) comparing CBT-I to sleep inducing medications (zopiclone, zolpidem, temazepam, and triazolam) for insomnia suggests that, on average, CBT-I is at least as effective as medications in the treatment of insomnia [45]. Moreover, Mitchell and colleagues reported results indicating that the benefits of CBT-I may be more durable than those of medication.

Given the elevated prevalence of insomnia among individuals who have experienced TBIs, coupled with the growing body of research supporting the efficacy of CBT-I for insomnia, it is surprising that, to our knowledge, only two studies have tested the efficacy of CBT-I associated with TBI [46,47]. These studies provided preliminary evidence that CBT may be an effective intervention for post-TBI insomnia. Although they yielded promising findings, both of these studies were limited by the fact that they relied on single-case experimental designs.

Sleep hygiene approaches may also prove effective for patients with TBI. A recent study from the Department of Veterans Affairs Palo Alto Health Care System (VA PA HCS) reports on the implementation of newly developed sleep hygiene guidelines at their institution [48]. More specifically, the new sleep hygiene program incorporated CBT, exercise, relaxation training, sleep restriction, and stimulus control. A convenience sample of 67 individuals with TBIs admitted to the 18–bed Poly trauma Rehabilitation unit at the VA PA HCS between 2009 (prior to the implementation of the new sleep hygiene guideline) and 2010 (post-implementation) were included in the study. Although not statistically significant, average sleep duration increased slightly from 2009 (M=7.3) to 2010 (M=7.7). However, no change was observed in disability as assessed by a measure of functional independence. Larger, well-designed RCTs are needed to test the efficacy of CBT approaches against credible comparison conditions controlling for placebo-related factors (e.g., treatment outcome expectancies, the passage of time) [49]. Moreover, to the extent that CBT is shown to be an effective treatment for post-TBI insomnia, research will be needed to examine what aspects of this multi component treatment drive improvement (e.g., comparing the full CBT-I package versus a CBT-I intervention which excludes cognitive techniques to examine the incremental benefits, if any, of the cognitive components of treatment). Similar to psychopharmacological interventions, there are no data available on pharmacological interventions in pediatric populations with TBI.

Circadian rhythm interventions

An individual's level of alertness is affected by a number of factors including light exposure, food consumption, and the diurnal fluctuation of melatonin. In healthy individuals, melatonin, a pineal hormone regulated by the hypothalamus, has been shown to influence the timing of the sleep-wake rhythm [50]. Normally, melatonin secretion increases dramatically with the onset of darkness and is believed to prepare the brain for sleep. Melatonin is produced naturally by the body and normally increases in the evening hours as light levels decrease [51]. During sleep, melatonin levels decrease slowly, dropping to their lowest levels in the early morning hours just before natural awakening. For individuals with delayed sleep phase disorder or other problems with sleep onset that may stem from circadian misalignment (i.e., biological circadian phase is out of sync with natural day/night or work schedules), melatonin supplementation may prove beneficial. Timing of melatonin administration is critical, however. Evening administration (i.e., before bedtime) of melatonin leads to an advance in the circadian rhythm (i.e., the person falls asleep earlier in the evening and wakes earlier in the morning), whereas morning administration produces a phase delay (i.e., the person falls asleep later in the night and wakes later in the morning) [52]. For healthy individuals wishing to fall asleep earlier in the evening (i.e., phase advancement), a dose of melatonin (0.3 or 3 mg) taken about 6 to 7 hours before bedtime appears to be effective at producing a phase advance in the circadian rhythm [53].

There may be a role for melatonin in sleep problems in TBI. Some evidence suggests that melatonin may itself be neuro protective in animal models [39,54,55]. Unfortunately, brain injury may affect the cycling or production of melatonin [51]. Due to its involvement in sleep onset, sleep-wake regulation [56], and its putative neuro protective effects, melatonin supplementation has been posited to improve sleep, subsequent daytime alertness, and recovery following TBI in humans. Indeed, one month of daily 5 mg melatonin (time of administration not specified) improved subjective ratings of daytime alertness, sleep quality and sleep onset latency in a small sample of adult men with chronic mild to severe TBI and subjective sleep disturbance [57]. However, objective cognitive functioning did not change, and melatonin did not prove superior to 25 mg tricyclic antidepressant that served as the control intervention. Because these data have not yet been replicated, definitive conclusions are not possible at this stage. To our knowledge, there have been no controlled trials examining the effectiveness of these types of treatments for TBI-related sleep complaints in pediatric samples.

Another method that has recently shown potential efficacy in regulating the circadian rhythm and sleep-wake cycle is morning bright

light exposure. Exposure to bright light during the morning hours, especially light in the blue wavelengths, has been shown to suppress daytime melatonin production and produce a phase advancement of the circadian rhythm. Carter et al. combined morning blue-wavelength light therapy with physical exercise and evening melatonin administration to successfully improve the sleep-wake rhythm in a 20-year old veteran who developed major depressive disorder and circadian rhythm sleep disorder following a mild to moderate TBI [58]. Bright light seems particularly promising given its demonstrated ability to improve subjective sleep quality and to increase alertness [59-61]. Comprehensive empirical evidence for its effectiveness in the context of TBI is pending, but emerging evidence by Ponsford et al. [62] suggests that this technique may be effective for improving fatigue in patients with mild to severe TBI. Studies in our own lab are currently ongoing to examine the effectiveness of bright light therapy in improving sleep and post-concussive symptoms in patients with mild TBI. As with most interventions, there are no known studies of light treatment with pediatric populations.

Alternative approaches

Similar to CBT, there are surprisingly few data on other non-pharmacological treatments in the literature. Acupuncture proved to be of some effectiveness in one recent study, as subjective sleep quality and objective cognitive functioning associated with chronic TBI (severity not disclosed) improved compared to pre-treatment, but not for the control group who did not receive the intervention [63]. Similarly, single-case studies suggest biofeedback to be effective to treat insomnia following TBI with comorbid posttraumatic stress disorder [64]. However, as systematic clinical trials are pending, there are currently not enough data to argue in favor of routine application of either acupuncture or biofeedback.

Conclusion and Future Directions

Overall, there is surprisingly little data on the efficacy of pharmacological and non-pharmacological treatment options for sleep disturbance following TBI. Published data have thus far focused exclusively on adult populations. Given that TBI is highly prevalent in children and adolescents [65], this is particularly problematic. The existing research literature in adult TBI is scant and fraught with methodological limitations. Most studies have included predominantly male populations and tend to ignore TBI severity. There are several reasons why it is imperative that future research begins to include information about TBI severity as a matter of course. In particular, brain damage and its behavioral correlates, including cognitive functioning, disability status, and awareness of TBI-related deficits have been shown to vary with TBI severity. This means that some treatment protocols might be more appropriate, and potentially more effective, for individuals with mild than severe TBI. For example, severe TBI may significantly affect meta cognition and self-reflection, which in turn may impede an efficient and effective implementation of CBT. In contrast, TBI severity may be less likely to moderate the efficacy of non-pharmacological approaches such as bright light therapy, although this currently remains an open question. Clearly, systematic studies are needed to establish the extent to which TBI severity might influence therapy outcome. Thus, for the field to move forward, treatment protocols need not only be developed for children and adolescents with sleep disturbance following TBI, but also tested in more balanced samples representing both sexes and carefully considering TBI severity.

In sum, the present brief and very selective review suggests that the extant literature on treatments for sleep problems among individuals with TBI is extremely limited. Non-pharmacologic approaches such as CBT, sleep hygiene, light therapy, and perhaps circadian influencing supplements such as melatonin appear to have some potential to improve sleep in this population. Comprehensive animal models of the effects of TBI on sleep disruption and larger, well-designed placebo controlled trials in humans are greatly needed before firm treatment recommendations can be supported.

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Editorial
Future Neurology

What are the emerging therapeutic uses of bright light therapy for neurological disorders?

"...light exposure, sleep and depression might be intricately linked, such that improving one aspect of this inter-relationship might benefit others..."

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Worldwide, at least 1 billion individuals live with a neurological disorder such as traumatic brain injury (TBI), stroke, Parkinson's disease or Alzheimer's disease [1]. As humans live longer, and modern medicine is becoming more and more advanced at preventing illness and prolonging lifespan, this number is likely to increase further. Every 20 years, the number of individuals affected by dementia alone is estimated to double, and by 2020, TBI is expected to be one of the major causes of mortality and disability [1]. As these neurological disorders increase in absolute numbers, clinicians and researchers will be ever increasingly challenged to develop more effective and targeted treatments to improve the life of the neurological patient and their families.

One problem that is frequent across neurological disorders, but receives relatively little attention, is sleep disturbance, a heterogeneous conglomerate of symptoms, such as difficulty initiating or maintaining sleep, early morning awakening and poor sleep quality. These sleep problems have profound consequences for daytime functioning, including excessive daytime sleepiness, impaired cognitive functioning or a greater need for daytime naps. For example, in 40% of patients with Parkinson's disease, sleep disturbance goes unrecognized, and therefore, untreated [2]. Likewise, at least 50% of individuals with TBI experience some kind of sleep disturbance at some point following their injury, but as with Parkinson's disease, these subjective complaints are often not identified or addressed through appropriate interventions [3,4]. This lack of attention to subjective sleep disturbance in neurological disorders, such as stroke, TBI or Parkinson's disease, is not surprising given that motor and cognitive symptoms are typically much more prominent, and sleep disturbance might simply be considered as a secondary symptom. However, failing to address sleep disturbance in neurological disorders is potentially problematic. For example, it is very well documented that poor sleep has wide-ranging effects on the ability to function in daily life; in general, alertness and concentration are adversely affected, behavior becomes more inconsistent and error prone, and emotions can fluctuate between extremes [5]. These well-established findings alone suffice to assign improving sleep in neurological disorders a more prominent role in the treatment protocol. Moreover, it might be particularly important for neurological patients to safeguard sufficient sleep both in terms of quantity and quality because sleep is essential for learning and brain plasticity [6]. Indeed, there is compelling evidence from the animal literature to suggest that sleep disturbance worsens many aspects of brain function in neurological disorders. For example, following experimentally induced brain injury in rats, sleep disturbance is associated with a significantly increased number of damaged cells compared with similarly lesioned rats obtaining normal sleep, while other research shows that sleep disturbance inhibits the formation of new neurons in the rat hippocampus [7,8]. The role of sleep in brain repair in humans has been less well documented, but some evidence suggests that similar processes may also be involved. For instance, in the case of adult TBI, the empirical evidence suggests that subjective sleep disturbance may complicate recovery from the injury [9]. Although the data are preliminary, these findings argue for greater integration of sleep assessment and appropriate treatment for neurologic patients, as it is likely that improving sleep could facilitate recovery,

Keywords

■ Alzheimer's disease ■ brain plasticity ■ bright light therapy ■ depression ■ Parkinson's disease ■ sleep ■ stroke ■ traumatic brain injury

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improve outcome and help maintain function in many neurological disorders.

> "Indeed, there is compelling evidence from the animal literature to suggest that sleep disturbance worsens many aspects of brain function in neurological disorders."

Ideally, an intervention that aims at improving sleep in patients with neurological disorders would not add to the medication burden or interfere with the natural recovery process, and would have no adverse side effects, but would be effective, easily accessible and widely applicable. Bright light therapy could be such an approach. Many aspects of human life are heavily regulated by the earth's 24-h dark–light cycle. Throughout mankinds' existence, humans have been exposed to this cyclical pattern of day and night, which appears to play a crucial role in regulating many of the daily biological rhythms of the brain and body. Moreover, the timing of exposure to daylight can have a profound effect on these regular (i.e., circadian) biological rhythms. Exposure to bright light early in the day will phase advance the circadian rhythm, leading an individual to be more alert in the earlier hours of the day and to shift the timing of sleep onset to earlier in the evening. This is believed to occur via stimulation of melanopsin-based nonimage processing photosensitive cells of the retina. Rather than projecting to the visual cortex, these photosensitive ganglion cells project directly to the suprachiasmatic nucleus of the hypothalamus, which has the effect of suppressing melatonin secretion. Melatonin onset normally signals the brain that it is night-time and prepares the brain for sleep. By suppressing melatonin, bright light shifts the circadian timing of the normal sleep–wake cycle. When light exposure occurs in the morning hours, the individual experiences greater alertness in the early part of the day and an earlier onset of sleep in the evening [10]. On the other hand, bright light exposure in the evening can have the opposite effect, causing a phase delay in the circadian rhythm of melatonin onset. Thus, evening exposure will tend to lead to greater alertness in the evening and a tendency towards falling asleep later at night and awakening later in the morning. With regard to bright light therapy, timing is critical.

Importantly, the photosensitivity of the retinal ganglion cells is greatest to blue wavelength light, suggesting that bright light therapy that includes mostly blue wavelengths might be a particularly promising adjunct approach in the multifaceted treatment of neurological disorders [11]. Indeed, bright light and blue wavelength light, in particular, have been demonstrated to induce changes in brain activation in areas involved in sleep, alertness and higher-order cognitive functioning, such as the thalamus, brain stem, hippocampus and dorsolateral prefrontal cortex, in addition to behavioral improvements in subjective sleepiness or motor response times [10]. Strategic application of bright light could, therefore, be useful to improve cognitive and motor function in some neurological disorders. Indeed, there is preliminary evidence for bright light therapy to improve motor function in Parkinson's disease [12], to attenuate cognitive dysfunction in dementia [13] or to improve speech recognition following ischemic stroke [14]. However, improving sleep might not be the only benefit that bright light therapy might offer to individuals with neurological disorders. Indeed, LeGates *et al.*'s series of elegant experiments provides compelling evidence that light directly modulates mood and emotion [15]. Whereas bright light therapy is currently predominantly used in the treatment of seasonal affective disorders, bright light therapy was also demonstrated to alleviate depressive symptoms in patients with Parkinson's disease [12], epilepsy [16] and dementia [13]. This is clinically relevant, as recent estimates suggest that depression may go untreated in more than 80 and 95% of patients following stroke and transient ischemic attacks, respectively [17]. Similarly, depression remains unrecognized and untreated in 65% of patients with Parkinson's disease [2]. Importantly, either a history of depression or current depressive symptoms are both associated with poor outcome in neurological disorders, such as stroke, compared with patients without such history, strongly suggesting that treating depression in neurological disorders may be of no less importance than treating sleep disturbance [18]. In fact, light exposure, sleep and depression might be intricately linked, such that improving one aspect of this inter-relationship might benefit others, possibly accelerating treatment response and yielding therapeutic benefits in a quicker, more effective manner [19].

> "Strategic application of bright light could, therefore, be useful to improve cognitive and motor function in some neurological disorders."

In 2006, WHO warned that, at least in some countries, the burden of neurological disorders

might become unmanageable in the near future [1]. Healthcare systems are already challenged, calling for new ways to manage and treat neurological disorders more efficiently. Particularly in neurological disorders, it is essential to facilitate recovery and maximize functional outcome, with sleep disturbance and depression being primary targets due to their wide-ranging effects on emotional wellbeing, cognitive functioning and rehabilitation efforts at the neuronal level. Bright light therapy seems a prime candidate as such an adjunct treatment module. However, for the field to fully recognize the capacities of bright light therapy and incorporate it into practice, more empirical research is needed. Several lingering questions need to be addressed, such as are there individual patient characteristics that increase treatment response to light exposure (e.g., age, gender and race)? Is bright light therapy more suitable for some neurological disorders (e.g., stroke, TBI and Parkinson's disease), but less suitable for others (e.g., epilepsy and Alzheimer's disease), and if so, why? How sustainable is the treatment response after the cessation of exposure? Does bright light treatment improve functional outcome? What are the benefits of bright white light versus narrower wavelength blue light with lower luminance? Although available data are preliminary, the findings from the animal literature and patient populations concerning the effect of bright light therapy on improving sleep and mood are compelling. We believe that the potential of light therapy to augment ongoing treatment and optimize functional outcome at the behavioral and neural level, are sufficiently convincing to argue in favor of increased research efforts to replace promising preliminary findings with sound empirical data.

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